The
Geographical Journal.

No. 5. NOVEMBER, 1911. Vol. XXXVIII.

PROBLEMS IN EXPLORATION: AFRICA.*

By FRANK R. CANA.

While it is true that, with one or two important exceptions, the main outlines of African topography have been ascertained during the last sixty years, a vast amount of work remains to be done before it will be possible to construct a map in which there will be nothing left to conjecture in any quarter of the continent. Moreover, geographical research is not confined to the exact delineation of the Earth's surface, but embraces the study of all the conditions which determine or modify the character of the land. Especially important is the study of physical conditions as they affect the well-being of man, and in Africa the field of investigation in biological geography and anthropogeography is almost limitless.

The subject of inquiry being so large, it is only possible in the present paper to indicate the main areas in which pioneer exploration is still needed in Africa and to set forth the chief physiographical problems awaiting solution. The fuller treatment which certain regions require—*e.g.* Morocco—must be left for future consideration.

More than 1,000,000 square miles of the continent—an eleventh of its whole area—still remains unexplored. Some three-fourths of this unknown country lies within the limits of the Sahara, but on that very account its exploration and investigation is of special value, for it is believed there is some evidence tending to show that over the greater part of the Sahara the desert conditions were formerly less severe (in some regions non-existent), and that present conditions may not necessarily continue. Besides the (now) desert regions there are, however, considerable areas of fertile country never visited by a European. Ten years ago there were

* Map, p. 556.

several tracts of territory, both on the west and east coasts, less than 50 miles from the seashore, where white men had not penetrated, and to-day there are still some such patches. The largest unknown littoral land is to be found in Liberia, where there are some 20,000 square miles of country—chiefly in two large blocks—in which no European has been, all within 200 miles of the coast. While the Franco-Liberian commission of 1908–9 determined the main course of the chief rivers, the centre of the country, with its dense forests and savage inhabitants, conceals many secrets of value to the ethnologist and naturalist.*

The explorer who might conceive Liberia (or similarly limited regions) † to be too small a field for the exercise of his activities would have his fill of adventure, and of hardship, if he endeavoured to follow the 20th degree of N. lat. from the west coast to the Nile. Starting from the neighbourhood of Cape Blanco, he would reach the Nile somewhat north of Dongola, and during the expedition (covering some 2600 miles in a straight line) would penetrate the heart of the largest areas of unknown Africa. It is improbable that any one will attempt the journey, but by following in imagination the route indicated we shall consider one by one the Saharan regions which require exploration and their relations to the adjacent portions of the Sudan.

The Western Sahara—The Juf.

The first task of our imaginary traveller would be to revise the chart of the coast, for which purpose temporary headquarters at Arguin island (possibly the Cerne of Hanno) would be convenient. Arguin has been known since the fifteenth century, but the neighbouring mainland remains inadequately charted. In 1908 two French travellers (Gruvel and Chudeau) made a journey overland to Cape Blanco from St. Louis, keeping close to the shore. They reported that islands shown on the map had no existence, and that others existed which were not charted. As the fisheries off the coast are valuable, and the French have created (in 1908) a harbour—Port Etienne—a little further north, in the bay formed by Cape Blanco, the accurate charting of this coast strip will probably be undertaken by them. Fully 100 miles of coast-line require to be surveyed. Leaving the coast, and setting his face steadfastly towards the east, our traveller would pass first through the territory which the French have named Mauritania. Their occupation of the district during 1908–9 has

* An indication of the nature of the work to be done in Liberia will be found in Captain Braithwaite Wallis's vivid description of a little journey into the unknown in the *Geographical Journal* for March, 1910. Besides his work on the Franco-Liberian commission in 1908–9, M. Moret, the second Liberian commissioner, made an independent journey in 1909 from Cribo to Sinoe. Further light on the topography of Liberia may result from the labours of the commission now engaged (September, 1911) in marking the Franco-Liberian frontier on the spot.

† The hinterland of Portuguese Guinea, for example, is very imperfectly known.

led to the elucidation of the main features of the country.* The traveller would traverse a fairly high plateau—in part fertile and seemingly capable of agricultural development—and cross the ranges of Adrar Tmarr—whose north-easterly extension remains unexplored. They appear to form the north-western boundary of the Juf. As he approaches this region the traveller would be faced with his first great problem. In the early centuries of the Christian era there was frequent and regular communication between the Western Sudan and North Africa. One much-used route ran north-west from the city of Walata—which lies somewhat south of 18° N. and a little west of 6° W. to Wadan (Ouadan) in Adrar. This route skirts the south-west borders of the Juf. Further east (beyond the eastern border of the Juf) is the well-known caravan track from Timbuktu to Morocco, first traversed by a European (René Caillié) in 1828. The region between these two routes is unknown; there extends some 120,000 square miles, more than half the size of France, upon which the eye of a European has never gazed. One might travel for over 300 miles in a direct line, either west to east or north to south, along virgin ground. The Juf is believed to be uninhabited, to be destitute alike of water and of vegetation; to be an immense basin covered with sand-dunes. Barth noted more than half a century ago that the Juf, by native report, was below the normal level of the Sahara. Oscar Lenz, who in 1880 skirted the Juf for a long distance, stated that in its eastern part it was some 350 feet below the altitude of Timbuktu, and 800 feet lower than the Igidi, the sand-dunes which border it to the north. Maurice Cortier, in 1906, again skirted the Juf between Timbuktu and Taudeni, and found its edge marked, for nearly a hundred miles, by a continuous line of cliffs about 260 feet high. Taudeni, which lies over 300 miles north of Timbuktu, is a small settlement in a depression which is in reality an extension of the Juf. It is noted for its production of rock salt.† Further north, and still on the edge of the Juf, is Traza, whence rock salt is also obtained. On the western border of the Juf, at Tichit, are other salt mines. This is nearly all that is certainly known of the Juf, save that numerous marine fossils have been found round its borders. Herr von Domann, in his map of the western Sahara in Stieler's Hand Atlas, shows indeed a caravan track from Walata across the Juf from south to north. This marking of a route is probably a native reminiscence of the time when Walata was the capital of a powerful state, and when the physical conditions of the western Sahara must have differed materially from those now prevailing. Certainly, the route is not now used; the Juf (if one may hazard a description of the unknown) possesses all the characteristics of the desert lands further east—the *tanezruft* of the Tuareg: a void land, a

* See "Mauritanie Orientale," by Lieut. Labonne, in *La Géographie*, vol. 21 (1910).

† Taudeni was also reached (from the north) in 1906 by Colonel Laperrine (see *infra*), and has since been visited by other Europeans.

land of fear and of thirst, which in haste and trembling the nomads cross in long marches, resting only four hours out of the twenty-four; a land, in short, where desert conditions are at their maximum.

Yet the exploration of this land of desolation might reasonably be expected to yield valuable results. It is almost certainly the dried-up bed of an ancient arm of the sea. The belief once current that the whole of the Sahara is but the exposed bed of the ocean has been shown to be untenable, but in Cretaceous times an arm of the sea reached inland as far probably as Lake Chad and Bilma. This sea extended south into the Sudan, and included the basin of the middle Niger. The theory of Gautier and Chudeau is that the last vestige of this "African Mediterranean" remained in the west, *i.e.* in the Juf, in the first period of the Quaternary age.* At that time, and perhaps up to a recent (even historic) epoch, the Niger ran north and entered the Juf by way of Lake Faguibine, the well-marked valley of Walata and the salines of Tichit. "The old bed of the Niger," says M. Gautier, "is not completely dead, but, with Lake Fagibine, is drying up under our eyes."† To follow the supposed former bed of the river would be to make a thorough examination of the south-western and western edge of the Juf, a task which might well be attempted.

The mystery of the Juf would then be in some measure elucidated; its solution depends also to some extent upon the thorough exploration of the area, almost equal in size to the Juf itself, which extends north-east from that depression to the Tuat oases. This country was first crossed by Europeans in 1904. It is a comparatively elevated flat region, with wells few and far between and the water (when found) often bad. Still life is possible, and the Tuareg cross it from Adrar (in Tuat) and Insalah to reach the salt mines of Taudeni. So desolate is the country, however, that in 1906, Colonel Laperrine, in leaving Adrar for Taudeni, made a wide detour to find a practicable road, and in returning by the direct route he had great difficulty in bringing back his company—fifty men all told—safe and sound. In one part over 60 miles had to be traversed without a single well being passed. Most of the animals—and fifty-four spare camels were taken for emergency use—and nearly all the baggage had to be abandoned. The information obtained during these journeys, made in haste by military parties whose object was not primarily scientific, is all that we possess concerning the area between south-east Morocco, the Tuat oases, and the Juf. Its exploration will, in time, be undertaken by the French. Already Gautier has made a beginning by tracing the Wad Messaud ("the joyous river") half a degree south-west of Tuat—to just south of 26° N. The Messaud, it may be mentioned, is the continuation of the Wad Saura of Tuat. If the river-bed follows in its lower course

* It must not be assumed that the Juf, though much below the normal altitude of the Sahara, is now below sea-level. The Taudeni depression has been ascertained to be about 250 feet above sea-level.

† See 'Sahara Algérien' (Paris: 1908).

the same general line it was found to be taking by Gautier, it should reach, some 220 miles further south-west, the depression of Taudeni. Now Cortier's investigations have shown that precisely where the mouth of the Messaud might be looked for a large river-bed, still moist, breaks through the cliffs which encircle the depression. Arnaud and Cortier, in the sketch-map accompanying their book,* do not hesitate to indicate the supposed course of the Messaud from Tuat to Taudeni. Gautier, who insists on the significance of the meaning of Messaud = joyous, has collected evidence—fragmentary, uncertain, but of value—which goes to show that this portion of the Sahara, between southern Algeria and the Juf, was within historic times fertile. The deduction he draws is that the Messaud and other rivers rising on the southern side of the Atlas all emptied into the Juf, which also received the Niger and other streams rising in the highlands of Futa Jallon. As late, perhaps, he conjectures, as the Roman era the western Sahara was for the most part fertile; peopled by a neolithic agricultural Negro race who extended north to the confines of the Atlas. The thorough exploration of this region should reveal traces of these neolithic Negroes, and of the Berber civilization which supplanted them.

Tibesti, Endi, and Borku.

If now we continue our investigations along 20° N., it is not necessary to linger long in the central Sahara. The incessant activity of the French since 1899 has resulted in the construction of an approximately definite map of that part of the desert. Large blocks are still, however, blank; there is, for instance, between Adrar of the Iforas and the oasis of Air a district as large as Scotland of which very little is known. It is traversed by the Wadi Taffassasset, formerly, it is possible, a great river, which, rising in the Ahaggar highlands, was, in Chudeau's opinion, the upper course of the present lower Niger.† These blocks and other blanks in the

* 'Nos Confins Sahariens' (Paris: 1908).

† This region was partially explored in 1909 by N. Villate, Colonel Laperrine, and Maurice Cortier. Leaving the Niger at Ansongo, Villate went east, and about 6° E. turned north, passing through the centre of the unknown region to the Ahaggar massif. In his outward journey, from Ahaggar to Adrar of the Iforas, he crossed many wadis which belong to the system of the Tilemsi, a river valley joining the Niger at Gao. Further east Villate examined the Azauak (or Assakaré), a wadi running south-west. He also crossed the Taffassasset, described as a vast denuded depression which appeared (between 18° and 19° N. and 6° E.) to be more than six miles across. Cortier, who travelled from Air to Gao, believes the Azauak to be simply the lower course of the Taffassasset. The year 1909 was marked by exceptionally heavy rains in the central Sahara and many of the river valleys contained water and bore vegetation. Villate found that the giraffe extended its range up to 16° N. The country between the Wadi Taffassasset and Ahaggar was barren *tanezruft*. Cortier reports the existence of a continuous line of cliffs, stretching from the south of Air to the south of Adrar (Iforas), these cliffs separating sharply the Saharan and Sudan regions. See Villate's paper (with map) and the note on Cortier's journey in *La Géographie*, March, 1911, and, for Chudeau's views, 'Sahara Soudanis' (Paris: 1909).

central Sahara are certain, before many years, to be filled by French explorers. But when, following the line of 20° N., our imagined traveller cuts the old highway between Bornu and Tripoli, he approaches Tibesti —that part of unknown Africa where exploration is likely to yield the most important results. By their occupation of Wadai in 1909 the French posted themselves on the south-western edge of this territory. They have, however, refrained, from political and economic reasons, from making any move in the direction of Tibesti, our knowledge of which depends, as far as Europeans are concerned, entirely on the work of Gustav Nachtigal.* From Murzuk in 1869 Nachtigal paid a brief visit to northern Tibesti; in 1871, from Bornu, he made a brief exploration of Borku, at the south end of the Tibesti highlands. Nachtigal was a most accurate observer, but he was able to do little in consequence of the hostility of the natives—the Teda or Tibbu, a race worthy of further study. Yet Nachtigal saw enough to make the Tibesti problem one of great interest. Tibesti extends south-east and north-west from about 22° N. to 18° N., and seems to be a volcanic massif forming a tableland over 3000 feet high, above which peaks and crater cones rise to a height of 8000 feet. This mountain chain, fully 400 miles long, is thought to play a most important part in the physical history of the Sahara, separating the absolute wastes lying to its east from the more diversified and certainly once fertile regions lying to its west. Since Nachtigal's time more than one adventurous spirit has planned to visit Tibesti, but such designs have hitherto failed of accomplishment. In the first half of this year (1911) it was announced that an Austrian expedition, under the leadership of Herr Otto Cesar Artbauer, intended to make its way (*viâ* Tripoli) to Tibesti. It seems, however, impossible to regard with any confidence the prospects of this undertaking.†

One geographical problem but leads to another. With the examination of Tibesti should go also the exploration of the regions—Borku and Endi—lying to its south and east and to the north of Wadai. No European since Nachtigal had visited Borku, a land concisely described as consisting of sand strewn with rocks, until 1905, when Captain Mangin made a dash to the oasis of Wun. This was followed in 1907 by a raid against Wadaian forces by Captain Bordeaux and Lieut. Gauckler,‡ which took them into Endi, a hilly country some 150 to 180 miles in diameter. "Endi" is stated to mean "the mountain," and a rocky escarpment divides it into a western district, peopled by Tibbu, vassals of Wadai, and an eastern district, peopled by Annas (or Nakazzas), said to be subject to Darfur. In Endi some of the masses of sandstone

* See 'Sahara und Sudan' (Berlin: 1879–89), a work of which, unfortunately, there is no English translation.

† Herr Artbauer has made various journeys in North Africa since 1906. See his 'Kreuz und quer durch Marokko' (Stuttgart, 1911) and the *Geographical Journal*, December, 1910, and January and September, 1911.

‡ See Captain Bordeaux's paper in *La Géographie*, October, 1908.

resemble ruined castles and churches, and vary in colour from white to black, passing through all shades of blues, reds, and violets. Its chief product is rock-salt. Such is the information gathered hurriedly in a few days during a military march; it is sufficient to stir the imagination and make one desirous of knowing more about the region and its relation to the Libyan desert. One fascinating hydrographical question awaits a precise survey of these central Sudan regions for its solution, namely, the long-rumoured but doubtful connection between the Chad system and that of the Nile. This connection—if it existed—could only have been by means of the Bahr-el-Ghazal of the Chad system. In Nachtigal's opinion the Bahr-el-Ghazal (more correctly the Soro) was an effluent of the lake and not an affluent, as has been more generally supposed. According to Mangin,* the direction of the underground flow of the Soro is towards Lake Chad, and specimens of rocks collected in its channel are of a kind not met with in the lower Shari basin, but seem to be derived from the Tibesti highlands. The question is considered at some length by Bordeaux, who adduces strong evidence in favour of the Soro being an affluent of the Chad. Admittedly, by rise of level the Chad has sent its overflow waters into the lower Soro, and the Tilho Mission (1908–9), as far as it was able to examine the Soro, found that its level was the same as that of the lake.† Tilho's map, based on the reports of other travellers, indicates that further east the Soro level is higher than that of Chad. But the levels have not been accurately determined. Chudeau,‡ who may have been unaware of Bordeaux's observations, was of opinion that the Soro (which has been dry for at least a century) formerly flowed past Borku—the furthest point to which it has been traced—between the hills of Tibesti and Endi to the centre of the Libyan desert, where it probably ended in a *shott*. Chudeau does not even exclude the possibility of the Soro having reached the Nile. He deems it improbable, pointing out that though the slope of the country Nilewards might be in itself sufficient to admit of a stream which passed Borku reaching the river of Egypt, it is not enough to enable such a stream to fight successfully the desert sands. Chudeau's theory, scarcely likely to be confirmed, is nevertheless of great interest; it recalls the ancient and mediæval belief in a great western arm of the Nile, and Major Rennell's supposition that the Niger ended by evaporation in the country of "Wangara," which he placed between 15° and 20° E.§

---

* *La Géographie*, May, 1907.

† See 'Documents Scientifique de la Mission Tilho' (Paris: 1910) and *Geographical Journal*, September, 1910.

‡ See 'Sahara Soudanais' (Paris: 1909), chap. v.

§ For the supposed Niger-Nile connection the reader may refer to the article "Niger" in the *Encyc. Brit.* (11th edit.). A map of the region between Lake Chad and Darfur, drawn by A. Meunier, utilizing the latest observations, is given in *La Géographie* for February, 1911.

The Libyan Desert.

The interdependence of one geographical problem upon another is illustrated by the supposition that the Soro may end in the Libyan desert. The attempt to trace the Soro would bring the traveller to the south-western confines of that desert, a direction from which it has never been approached. Some knowledge of its character has been obtained where it borders the Nile, and to the north, along the edge of the Cyrenaican plateau,* and notably by the hazardous journey made from Barca to the Kufra oases by Gerhard Rohlfs and Anton Stecker in 1879. In Kufra Rohlfs and his companion spent two months, and were then compelled by the Senussites to retrace their steps. The general character of the desert is that of rocky wastes in the north and east, and a vast sea of sand in the centre. In addition, a long, thin line of sand-dunes, some 4 miles in breadth and 400 in length, runs north-north-west and south-south-east, parallel to and not far distant from the Nile, other similar bands of dunes extending further west. These dunes have barred the progress of travellers who have endeavoured to reach the recesses of the desert from Egypt. Rohlfs tried in 1873–74, and his observations have been confirmed by subsequent investigators, such as Captain Lyons, Major Comyn, Mr. Jennings Bramley, Mr. H. E. Hurst, and, notably, Mr. Llewellyn Beadnell, to whose paper in the *Journal* (April, 1910) the reader should specially refer. These sand-dunes are wind formed, and are not stationary, and while they have blotted out formerly fertile land, in some regions (*e.g.* Kharga oasis) they have actually helped to increase the area of cultivation. While the general hopeless character of the desert may be increasing, as shown by the partial obliteration of the caravan track which a century ago ran from Kufra to Dakhla, much might be done by extended reclamation work. And of the south-western part of the region, between Kufra and Tibesti and Endi, nothing is known.† It is the land of the Senussi, and is probably but semi-arid, and diversified by mountains, watercourses, and cultivated areas. Through it runs a caravan route of great antiquity, along which have passed many thousands of slaves and eunuchs destined for the households and harems of the East. Besides this part of the Libyan desert the region adjoining it to the north, *i.e.* the hinterland of Cyrene and Tripoli, would well repay exploration. Its character has changed within historic times. In the Pharonic period this region was very fertile, containing much grass and forest land; in the Tripolitanate water was abundant even in the Roman period. The change of climate here has probably

* Hornemann in 1798 travelled from Siwa to Murzuk by a route which no one has since traversed in its entirety.

† What, for instance, becomes of the drainage from the eastern slopes of these mountainous countries? Are the torrents descending from Tibesti in any way connected with the Nile? Had that river at any time great western affluents below Dongola?

had much to do in the production of the desert conditions further south. The whole district is still fairly productive and so capable of reclamation that the railway being built westward from Alexandria by the present Khedive (Abbas II.) at his own expense, is proving a commercial success. In this field the archæologist may hope for interesting finds. Somewhere here, too—west of Siwa, according to Bedawin report—is a mysterious and possibly not altogether mythical city of copper. There is also work for the archæologist on the south-eastern side of the Libyan desert, roughly along the route from Assiut to Darfur. Indications are not lacking that this district was formerly much frequented, and there are rumours of the existence of an unlocated oasis between Selima and Kufra.*

The Upper Nile Basin.

In comparison with the mysteries of the Sahara, the problems presented in other parts of unknown Africa are on a much smaller scale. But they are not less attractive, and they are at least as easily capable of solution. They concern chiefly the basin of the Upper Nile and adjoining regions of the Congo basin, Morocco, and parts of Abyssinia, Somaliland, and British East Africa. In the Upper Nile basin the Kioga (Ibrahim) lake-system is still imperfectly known, but the most important unsolved hydrographical puzzles concern the Bahr-el-Ghazal and the Sobat. The Bahr-el-Ghazal region is supposed to be fairly well known, and yet it is impossible to state definitely the number of important affluents which join it below the Sue or Jur (which must be regarded as the true upper course of the Ghazal). The course of none of these northern affluents has been traced in full, and to add to the confusion the same names are given to three or four different rivers. While it is certain that one large river rising in southern Darfur reaches the Ghazal, it is unproved whether one or two affluents of any length join the Ghazal from Kordofan. Major Comyn† is of opinion that the Wadi Shalango of southern Kordofan is the upper course of the stream marked Bahr-el-Homr in Captain Lloyd's map of that province given in the *Journal* in March, 1910. Captain Lloyd, on the other hand, states definitely that the Shalango loses itself in swamps and does not reach the Ghazal. There is here a considerable area of unknown land. Moreover, the whole frontier along the Congo-Nile and Shari-Nile watersheds and the Wadai-Darfur border remains unsurveyed—a matter of political importance since the French occupation of Wadai.

The district between the Bahr-el-Jebel (Mountain Nile) and the Sobat contains the only large stretch—about 500 square miles—of absolutely unexplored country in the Anglo-Egyptian Sudan. Its exploration will

* For a vivid description of this region, see Comyn's 'Service and Sport in the Sudan' (1910), chaps. xxii. and xxiii. Cf. the *Geographical Journal*, February, 1911, p. 212.

† Comyn, *op. cit.*, pp. 227–230.

solve the mystery of the Khor Filus. Comparatively near its mouth the Sobat receives a stream so named, but it has not been ascertained if it be an independent stream or (like the Bahr-el-Zeraf) a divergent channel of the main Nile, or alternatively a divergent channel of the Sobat itself. The very important part played by the Sobat system in the Nile floods renders a full knowledge of its basin desirable. The Khor Filus was traced up stream for some 80 miles by Captain H. H. Wilson in 1902,* but its course has not been followed further. A connection between the Filus and the streams described by Sir J. R. L. Macdonald as descending from the Latuka plateau has been suggested. Perhaps this riddle will not be read until it becomes necessary to survey the Uganda-Sudan frontier east of the Nile. A connected question is that of the source of the Pibor, the western main branch of the Sobat. Several travellers who have crossed from Abyssinia to the upper Nile have made contributions towards the solution of the problem; among the latest is Major H. A. C. Darley, whose travels in 1908–9 appear to carry the river a degree further south than had previously been supposed.† Generally one may infer from what is known of the surrounding district that the unknown region between the Bahr-el-Jebel and Abyssinia is an undulating plain, a swamp in the rains and a thirsty land at other times of the year. It probably possesses much sylvan richness, and supports a considerable population of unsophisticated Negroids.

British East Africa and Somaliland.

A much larger area of unknown country than that last mentioned exists in the adjacent regions of British East Africa and Somaliland. There is a volcanic district worth exploration east of Lake Rudolf and south of the Abyssinian frontier surveyed by Captain Maud in 1902–3, and by Major Gwynn in 1908–9. Donaldson-Smith skirted the region in 1895, Count Eduard Wickenburg crossed it in 1901, and in 1908 Captain Stigand, along its western edge, obtained a glimpse of its lava-strewn plateau. Its thorough exploration might open up a trade route between the coffee-growing country of Kaffa and the Uganda railway, and would elucidate the connection between the mountain systems of Abyssinia and British East Africa. Stretching south-east of this volcanic plateau is an area with many blanks in the map. In the Jubaland province of the British East Africa protectorate and neighbouring districts (Tanaland, Italian and Abyssinian Somaliland, etc.), there were, as late as 1907, fully 125,000 square miles of unexplored country,‡ not, however, in one continuous stretch, as here and there intervened blocks crossed by the routes of Europeans. There have been no great expeditions of late years into this part of Africa, but good work has been done by the survey staff in British

* See the *Geographical Journal*, October, 1902, p. 401.

† *Ibid.*, February, 1911, p. 213.

‡ Cf. the British War Office map of Jubaland (1908).

East Africa, and by independent travellers, such as Lieut. L. Aylmer, who in 1909–10 made interesting investigations in the region between 2° N. and the Abyssinian frontier. Still a large area remains unknown.

One problem not yet solved is that of the continuation of the Guaso Nyiro. This river rises in hill country north-west of Mount Kenya, and flows in a north-east direction. After a course of over 350 miles the river, in about 1° N. 39° 30′ E., reaches the Lorian swamp, discovered in 1893 by Chanler and Von Höhnel, who reported it to be seemingly of great extent and filled with high reeds.* The swamp was stated to overflow occasionally and send its waters further east. In 1901 Count Wickenburg, coming from the north, passed the eastern end of the swamp and found no stream flowing from it. Colonel Broun, who reached the swamp in 1904, confirms Wickenburg,† but there is at least a possibility that a river, named Lakdera (or Lag Dera), does "flow" east from Lorian to the Wama, a lake-like sheet of water which joins the Juba near its mouth. The lower Lakdera was surveyed in 1898 by Captain C. O. Tanner from Wama to above Afmadu, and on his map it is said to come from Lorian. Mr. A. C. W. Jenner, sub-commissioner for Jubaland, to whose party Captain Tanner was attached, in his report ‡ wrote of the Lakdera as "the great watercourse which runs from Lake Lorian." Yet below Afmadu the Lakdera is often dry, and it is improbable that in normal years the swamp sends any appreciable amount of water eastward. The Guaso Nyiro forms, more probably, an inland delta. "Very large areas" on either side of the river for 100 miles above the swamp are, according to Broun, admirably suited for irrigation.

The country between the Lorian swamp and the furthest point reached by Captain Tanner remains unexplored, but Lieut. Aylmer has thrown some light on the general hydrography of the region. The watershed between the Juba and Rudolf basins is formed, he states, by the Huri hills and the Marsabit range. His map § shows, for the first time, a long watercourse, the Lag Duba, rising in the Goro escarpment and running south-south-east. This and other stream-beds have a direction which should connect them with the Lakdera, and it is to be noted that Captain Tanner found a stream coming from the north which joined the Lakdera at Afmadu. All these tributaries or sub-tributaries of the Juba seem, however, unlike the Guaso Nyiro, to contain water only in the wet season.

It is highly desirable that the mountains, rivers, and lakes of this part of East Africa should be made known with certainty. The country is inhabited by wild Galla and Somali tribes, and most of it is semi-arid

* See W. A. Chanler, 'Through Jungle and Forest' (London: 1896).

† For Wickenburg's travels see *Petermann's Mitteilungen*, vol. **49** (1903), and the *Geographical Journal*, February, 1902; for Broun's journey, his paper in the *Geographical Journal*, January, 1906.

‡ See 'Précis of Information concerning the British East African Protectorate,' with maps. War Office, 1901.

§ See Lieut. Aylmer's paper in the *Geographical Journal*, September, 1911.

bushland, but the soil is rich and there are many areas besides that above Lorian suitable for cultivation.* On the Italian side of the Juba the first exact surveys are being made this year (1911). The district between that river and the Gulf of Aden has been crossed by several explorers, but, especially in the coast region, there are numerous unknown patches. This country had a pre-Mohammedan civilization as well as a Stone Age, and may yet reveal much of interest to the anthropologist and archæologist.

Other Regions.

Brief reference must suffice to indicate other districts where pioneer and semi-pioneer work is needed. The map given shows that but a small part of Africa has been surveyed with any degree of accuracy. Even in regions where it would be scarcely accurate to speak of "exploration" being required there are annoying gaps in our knowledge. Thus, in commenting on the 1909 War Office map of Southern Rhodesia, Mr. E. A. Reeves states that "there are many blanks to be filled in." With greater force the same remark applies to th · hinterland of the Portuguese colonies; both in Angola and in the region between Lake Nyasa and Mozambique there are considerable blanks (noticeable enough on a large-scale map). In like manner Abyssinia is only half known, and the Danakil country between Abyssinia and the Red sea—remarkable for its salt lakes and volcanoes—is in similar case, despite the good work of the Italians, G. Dainelli and O. Marinelli. Half of Morocco remains to be mapped as well as the coast region south of Cape Juby.† In the western Sudan and the adjacent Saharan regions the chief work that remains undone is archæological. Lieut. Desplagnes claimed that in 1907 he identified the site of Ghanata (Ghana), and other sites connected with the native civilizations which continued to flourish until the arrival of the Andalusian Moors in the middle Niger in the seventeenth century have been located, but much remains to be accomplished. Similarly, Nubia, the Red sea district, and South-East Africa have not yet yielded up all the evidence they possess of their former civilization. Finally, the Kalahari may be instanced as a region containing areas not yet explored. As the last refuge of the Cape Bushman it is an attractive spot to the anthropologist as well as to the student of physiogeography. Not the least interesting of Dr. Pöch's observations in the southern Kalahari in his journey during 1909, was the finding lines of sand-dunes—reaching a height of 160 feet—running, as in the case of the Libyan desert dunes, north-north-west and south-south-east.

---

* Note, for example, Major Gwynn's remarks concerning the water-supply at El Wak in the *Geographical Journal*, August, 1911, p. 120. The great fertility of the land in the immediate neighbourhood of the Juba, when under irrigation, has been amply demonstrated.

† A summary of the existing state of geographical knowledge concerning Morocco will be found in Louis Gentil's article, "Le Maroc et ses richesses naturelles," in *La Géographie*, vol. 21 (1910).

Putting together all these pieces of work undone, it will be seen that Africa still offers an ample field for the energies of the most daring explorer, as well as countless opportunities to the patient investigator of particular problems. Nor should it be forgotten that limits of space have forbidden more than a reference to some of the most pressing subjects of investigation—notably to the relation between the physical structure of the continent and the lines of development of its inhabitants, white as well as black.

NOTE.—In the preparation of this paper the writer has been indebted to Mr. E. Heawood, librarian to the Society, for valuable suggestions. His thanks are also due to Mr. E. A. Reeves, map curator to the Society, and to Mr. Reeves' assistants, for the construction of the map.

INTERNATIONAL AIR MAP AND AERONAUTICAL MARKS.*

By M. Ch. LALLEMAND, Inspecteur-General des Mines, Directeur du Service du Nivellement général de la France, Membre de l'Institut et du Bureau des Longitudes, Président of the French Association for the Advancement of Sciences.

I. PRELIMINARY ACCOUNT.

THE dirigible air balloon and more especially the aeroplane, which are scarcely out of the period of research and experiment, will soon enter into the area of practical politics. To-day, still mere instruments of sport or of military reconnaissances, they will become, to-morrow, valuable means of transport. It is time that aviators were given means for finding their way, similar to those which, for a long time, have existed for navigation and travel.

Whether on sea, land, or in the air, the pilot has always before him the same triple problem to be solved. He must from time to time—

1. Recognize his position ;
2. Determine the direction of the point to be reached ;
3. Rapidly estimate the distance remaining to be covered.

For terrestrial locomotion, the solving of these various problems was greatly simplified by producing special maps for the use of travellers and by erecting, along the principal routes, easily visible signs, such as mile stones, plates indicating the names and distances of more or less remote towns, sign posts at road junctions, etc. But the marking or buoying of routes presupposes a course fixed in direction and limited in extent. Admirably suited for travel by land, this system is still, to a certain extent, applicable to coasting trade, *i.e.* for sea voyages along coasts or in estuaries. But on the other hand, for travel on the high sea, this method is unsuitable and, for aerial navigation, quite useless in foggy weather or at night. In

* British Association, Portsmouth, September, 1911.

the latter case, it is necessary to use a compass. In spite of fog, darkness, or the absence of marks, the use of the compass enables the pilot to follow the desired direction, which direction has been previously marked off on the map, and, in the case of aerial travel, determined by a prominent object on the horizon, such as a clock tower, an isolated tree, etc. Knowing his speed, the pilot may, at any subsequent time, roughly estimate the distance already run and approximately deduce his proper position.

This position will, of course, be very frequently rectified, according to the indications of the map compared with the features of the terrain. The aviator will endeavour to recognize characteristic points, such as a high building, for instance, or the crossing of a canal with a railway line, or the junction of two rivers, etc. Now the compass will not always suffice. Unknown to the pilot, a water current may cause the ship to drift; similarly, an unseasonable change of wind may pull the dirigible or aeroplane out of its course, when travelling in fog or above the clouds. Both the seaman and the aerial pilot, when opportunity occurs, by the lifting of the fog, or daylight re-appearing, must recognize their position and, if necessary, rectify their route.

For this, the seaman must make use of the sun, moon, or stars, and deduce, from their observation, the geographical co-ordinates, *i.e.* the longitude and latitude—of his position. Owing to the rather precarious conditions of the arrangements on board, it would be pretty difficult, for airmen, to use this method. Fortunately for them, travelling over sea is rather an exception. They would be saved any reckoning, by placing all over the country, at convenient intervals, *aero-nautical marks*, *i.e.* by writing, on the ground itself or on the roofs of buildings (by means of conventional signs or very conspicuous numerals), the longitude and latitude of the corresponding site. Having read these, the pilot, with the help of a map, would be enabled to recognize his proper position and to reckon the distance of his destination, as well as its new orientation, *i.e.* the inclination, to the meridian, of the new direction to be followed.

Notwithstanding every artifice, however, this method is still long and difficult enough, and would only be useful were it possible to exactly follow the arc of a great circle cutting the pilot's destination, which, as a matter of fact, is rendered impossible by side winds and terrestrial obstacles. Airmen, like most seamen, will prefer to mark off the point on a map, or more simply to trace it on a simplified sketch such as the index diagram (Fig. 1, showing the fitting together of the sheets of the detailed map), upon which can be read the approximation of both required elements—distance and orientation.

For instance, an aviator flying over Bourges (the town marked by a black point at the bottom of sheet 72 of the index diagram) towards Pau (black dot in the lower half of sheet 39), would at once see that the distance remaining to be covered is nearly equal to $4\frac{1}{4}°$ of latitude measured on the diagram. Each degree being 67 miles long, the required distance

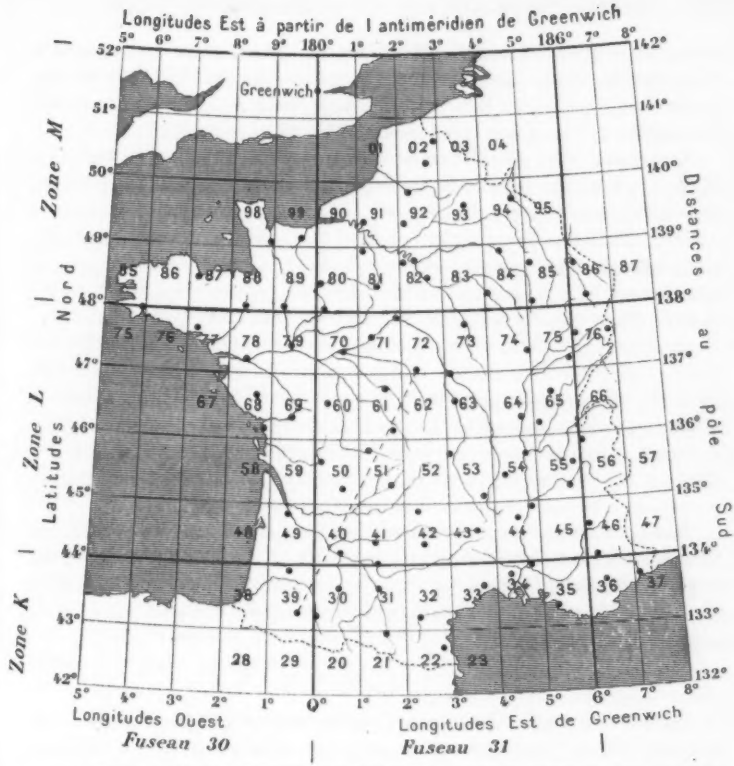


FIG. 1.—INDEX DIAGRAM SHOWING FOR FRANCE THE SHEET LINES OF THE AIR MAP.

———	Limits of the sheets of the Air Map.
═══	" " " World Map.
37 ... 72	Numbers of the sheets PAU . . . BOURGES, etc.
30 31 32	Numbers of the sectors of the World Map.
K L M	Letters of Zones of the World Map.
•	Chief towns of Departments.
.....	Itinerary from Bourges to Pau.

FIG. 2.—AERONAUTICAL MARK.

Erected on the roof of a building in the environs of Pau, which occupies, in the lower half of sheet 39, the relative position represented by the large dot, both on the above frame and on the index diagram (Fig. 1).

The co-ordinates of the S.W. corner of the sheet 39 are: 133° south polar distance and 179° new longitude E. reckoned from meridian 180° E. or W. of Greenwich (*i.e.* 43° long. N. and 1° long. W. of Greenwich).

would be roughly 285 miles. Moreover, the direction to be followed is 26° to 27° W. of the meridian to the south, say, magnetic S. 40° W. (the magnetic declination at Bourges being 13½° West). The compass should therefore show the complement, say N. 140° W.

If necessary, this diagram could even suffice for travelling. A straight line having been drawn, joining starting-point and destination, the pilot can see that his way will run successively right across the upper left angle of sheet 62, then cross the lower half of sheet 61, thereafter cut the upper edge of sheet 51 about the centre, pass through the right hand corner of the lower half of sheet 50, cut diagonally across sheet 40, graze the upper left corner of sheet 30, and finally end about the middle of the lower half of sheet 39.

Let us suppose that, at any moment, the pilot observes, on the ground below, a mark similar to that of Fig. 2, with the two figures 5 and 0 on either side respectively, and with a large dot occupying the proper position of the town of Angoulême in the upper part of sheet 50 of the index map. He would at once conclude that he had deviated to the right of his route, and after a rough estimation he would incline 25° to 30° to the left. But, in every case, a detailed map would be necessary for landing.

Having examined many systems, the Permanent Committee for Aerial Navigation of the Public Works Department of the French Government, recently proposed, for this map and for aeronautical signs, the following solutions, that seem to be the simplest ones and also the most likely to be adopted by other countries.

II. Air Map.

In order to attain the required object, and to keep to the necessary clearness, an air map must show only the details required by airmen, either for finding their way or for landing.

To the first category belong the characteristic geographical features of the terrain, such as railways, main roads, channels, streams and rivers, lakes, forests, bushes, clumps of isolated trees, large areas of a similar cultivation, large boroughs with their outline and principal streets, chimneys of factories, clock towers, high towers, and briefly, all objects liable to attract the attention of the pilot from a distance, either by means of their shape, dimensions, colour or situation.

To the second category belong turf pits, thick hedges, irrigation or drainage canals, electrical power lines traversing fields, and generally all objects liable to impede landing; and, in addition, gasometers, aerodromes and sheds where, if necessary, refuge or help could be obtained.

In the opinion of all competent authorities, the scale of 1 to 200,000 seems to be the most convenient one. On a smaller scale the map would be less clear, on a larger scale unwieldy without appreciable advantage. In many countries, maps on this scale already exist, but having been produced with special objects, either economical or strategical, they only imperfectly satisfy the wants of airmen. A new special map is

therefore necessary. A provisional model, submitted by the Aero Club of France, showing specially the typical buildings by their profile in black, was adopted by the Committee.

At my suggestion, it was decided that the new map should be a subdivision of the "International Map of the World," on a scale of 1 to 1,000,000,* for the production of which, on the happy initiative of England, a common agreement was recently arrived at between the principal states of the civilized world.

The "World map" would furnish index diagrams for the fitting together of the sheets of the "Air map." It would also be useful for drawing up schemes for long journeys, or for measuring the distance between two widely separated points, and obtaining the orientation of the line joining them.

The "World map" is to be designed with the *metre* as unit of lengths, and the *meridian of Greenwich* as origin of the longitudes. The sheets are limited by meridians drawn out at successive intervals of 6°, extending from Greenwich, and by parallels traced out at successive intervals of 4°, reckoning from the Equator.

The meridian sectors, from longitude 180° E. or W. of Greenwich, are given numbers from 1 to 60, increasing in an easterly direction. The zones, extending from the Equator, on each side, to 88° latitude, are given letters, from A to V, preceded by the words North or South. The polar areas are lettered Z. Each sheet shall bear the name of the locality or most important geographical feature on the territory represented, and, in addition, the number of the sector and the letter of the zone crossing each other on the sheet in question. For example, the sheet of Paris will be named "North M. 31."

For each sheet, the corresponding part of the terrestrial ellipsoid is represented by a modified polyconic projection constructed on its central meridian. The meridians are straight lines, and the parallels, arcs of circles, the centres of which lie on the prolongation of the central meridian, so that the radius of each one is equal to the generatrix of the cone tangent to the ellipsoid along the corresponding parallel. The alterations of angles, distances and areas, are practically small enough to be neglected.

On the other hand, the sheets of the air map will be limited by meridians and parallels at successive intervals of 1°, reckoned from the same origins as for the World map. Each sheet should cover an area of 1° of longitude and 1° of latitude. Twenty-four sheets of this map will therefore cover the same area as the corresponding sheet of the World map on the scale of 1 : 1,000,000. As the scale is five times as large, each of these sheets will be of approximately the same dimensions as the corresponding sheet of the 1 : 1,000,000 map.

* That is not to say that the air map will be an *exact* amplification of the World map, but nearly so.

It is necessary, however, to introduce a more simple method of notation. It is customary to distinguish between longitudes East and West of the initial meridian, and between latitudes North and South of the Equator. The nomenclature of the latitude and longitude therefore changes as one passes across either of these lines of origin. In other words, degrees of longitude increase to the right or left from the initial meridian, and degrees of latitude increase both north and south from the Equator. This notation is apt to cause trouble.

In order to overcome this disadvantage, the Committee, at my suggestion, has decided to number the longitudes from 0° to 360°, in an easterly direction commencing from longitude 180° E. or W. of Greenwich, and to substitute, for latitudes, polar distances measured from the South Pole, and reading from 0° to 180°. This is done in order that, in the northern hemisphere, in which are situated most of the inhabited countries, the number may increase as usual from the equator northwards. Moreover, in the northern hemisphere, the units of degrees would be the same for a south polar distance as for the corresponding latitude. The units of the longitude thus adopted will be the same, between 180° and 360°, as they are now for longitudes East of Greenwich. The tens of degrees, in the case of South polar distances, will be increased by 9 units, and, in the case of longitudes east of Greenwich, by 18 units.

In the Southern hemisphere, the polar distances will be the complements of the corresponding latitudes, and in the hemisphere extending from 0° to 180° of longitude, the new longitudes of places will be the supplements of the present longitudes west of Greenwich. In addition to the usual notations, these new ones should be printed on the World map and on the Index Diagram, Fig. 1.

Each sheet of the air map will bear the name of the most important locality on the area covered by it, and shall be numbered by the co-ordinates of its south-western corner. This number shows the number of degrees of longitude and south polar distance in the co-ordinates of any point in the sheet, and in order to obtain the complete co-ordinates of any given point, it will be sufficient to add, to these degrees, the tenths of degrees or minutes, obtained from the marginal scales.

The "air map" will be constructed on the same modified polyconic projection as that used for the world map. Each sheet shall be 56 centimetres, or 22 inches high, and from 41 centimetres to 34 centimetres broad (in France). The corresponding breadth near London would be 12 inches. Each sheet in France would, therefore, cover an area of 111 kilometres, or 67 miles, north and south, and from 82 to 68 kilometres (61 to 41 miles) east and west.

In this system, the distortion, which increases as the square of the distance from the central meridian, would be 36 times as small, in the air map, as in the world map, since a sheet of the air map covers only one degree of longitude, instead of 6 degrees. As, however, the scale of the

air map is 5 times as large, the errors from this source are reduced to $\frac{1}{5}$th of those in the world map.

In order to facilitate handling, each sheet should be cut in half, the cutting lines running east and west, each half measuring some 28 by 38 centimetres (11 by 15 inches). The two half sheets should be pasted on either side of a piece of cardboard, and should have the name and number of the sheet shown in a conspicuous manner.

The Aero Club of France have prepared, this year, three trial sheets of this map, covering the area to be used in the next military manœuvres, with a view to obtaining the remarks of the aviator officers, previous to publishing a final edition.

III. Aeronautical Marks.

As has been previously mentioned, each mark shall show the approximate longitude and polar distance of the point over which the aviator is flying. The sign adopted by the Committee consists of half a rectangle (Fig. 2) reproducing, on a sufficiently large scale, the frame of the half sheet of the air map in which the mark lies. The sides of this frame appear as broad lines, except the side where the cut is, which is shown by a fine dotted line ; thus, it is easy to distinguish between the upper and lower halves of a sheet. In this frame a large black dot will indicate the correct position, on the sheet, of the mark of the ground.

The half rectangle is correctly oriented, the small sides, parallel to the meridians, being due north and south.

Two large figures, reading towards the north, will be marked on either side of this rectangle, the left one giving the number of the units of degrees of the polar distance, and the right one, the number of the units of degrees of the longitude.

The combination of these two figures, forming a number easy to read and remember, will be sufficient to define the number of the corresponding sheet of the map, and to give the rough co-ordinates of the mark itself. In every case where confusion might exist, each of the figures should be underlined.

Owing to the absence of the digits showing the hundreds and tens of degrees of longitude and polar distance, any two marks, which are 10°, or a multiple of 10° apart, will have the same number. The disadvantage of this would not be of great importance. For an airman, to confuse two such marks, would mean that he would make an error of 10° of either longitude or latitude. In latitudes between 40° and 50°, this error would amount to 1100 kilometres (700 miles) of latitude, or from 700–800 kilometres (400–500 miles) of longitude.

In an area covering the whole of France, only the extreme points of Brittany and the Vosges will have marks showing the same numbers. Consider, for instance, the marks numbered 39 in the environs of Pau. The same number as this, on land, would not occur again nearer than

points in Algeria, England, Belgrade, or Hamburg, and would not appear at all in Spain or Italy. To mistake such dissimilar countries would be practically impossible.

To determine the correct co-ordinates of a mark, an aviator would only have to add to the number shown, the hundreds and tens of degrees of polar distance and longitude. The remainder, with an error of perhaps a tenth of a degree (or a few minutes) could be estimated by examining the position of the dot, with reference to the sides of the mark.

The position of the mark could thus be estimated with an error of less than 10 kilometres (6 miles) in either direction.

IV. Conclusion.

The initiative thus taken by France in producing an air map and establishing aeronautical marks will very probably be followed by other countries. In such a case, it would be necessary to have an international agreement, to give definitely the conventional signs of the air map and other details.

In May last, the Cartographical Committee of the International Aeronautical Federation, which met in Brussels to consider such questions, adopted in principle the meridian of Greenwich as the origin of the longitudes, a scale of 1 : 200,000 for the air map, and for the limits of the sheets, meridians and parallels one degree apart, starting from Greenwich and the Equator, and decided that electrical power lines, which are so dangerous for air-ships and aeroplanes when landing, should be shown on the map.

As regards the aeronautical marks, this Committee did not venture to select any one system, out of the numerous ones that were proposed, and only suggested that the names of the respective localities should be marked, in large letters, on roofs, especially on those of railway stations. As many stations, however, would thus show the same name, this would be a source of error and confusion; in addition to this, the aviator would have to consult a dictionary of names of boroughs, in order to find the number of the sheet of the air map which he requires. A system of marks showing the cutting lines of the sheet concerned, together with an abbreviated distinguishing number, seems to be much more precise, significant, and certain. It is therefore to be hoped that, sooner or later, this system will be universally adopted.

The following discussion took place:—

Captain H. G. Lyons: In aerial locomotion maps of the Earth's surface are as necessary as they are for the navigation of the ocean and for travel by land, in order that the airman may lay out his course, determine his position at any time, and know the distance already traversed or that which he has still to go.

Nearly all the material necessary to prepare such maps is already available and in the hands of cartographers, but it remains to sort it out so that the best use may be made of it, and to this end the co-operation of the practised aviator is essential, just as the navigator has taken part in the development and

improvement of marine charts and the geographer in those of land areas. In such combined action the best results will be obtained, since at least two points of view are involved. The airman will know what objects it is most important for him to recognize, and the cartographer will best appreciate how such can be most clearly and suitably represented. The one may perhaps be inclined to demand too much from his special map; the other may be tempted to produce one whose technical excellence may be unfavourable to rapid reading.

The matters which may arise in this discussion may range widely, so that it is desirable to group them under main headings in order to attain the clearness and freedom from ambiguity which M. Lallemand has shown to be essential in maps for the aviator's use.

These main groups are—(1) the construction of the map; (2) the representation of the relief of the Earth's surface; (3) the topographical detail which must be included; and (4) the information to be added relating especially to aviation.

I. In the first class M. Lallemand has already dealt with the essential points. As regards the scale, 1 : 200,000 seems to be that which is most generally approved, when supplemented for general reference, by the 1 : 1,000,000 which is now being produced internationally. Our map on the scale of 4 miles to 1 inch, 1 : 253,440, falls between the 1 : 200,000 and the 1 : 300,000 which have been proposed for use on the Continent, and on it the course of an hour's flight at 60 miles per hour will be represented by15 inches. Of course, as viewed from any altitude at which the airman will ordinarily move, the Earth's surface will appear as a map on a far larger scale than this, so that detail must be reduced, selected, and in some cases exaggerated to facilitate reading. If the 4 miles to 1 inch is adopted as the basis, the degree sheets will, of course, be somewhat smaller than those described by M. Lallemand; but here the question of economy in reproduction also enters, and must be taken into account. Proposals for the numbering of sheets and the identification of localities we have already had from M. Lallemand, so that I will pass on to the next question.

II. An accurate rendering of the relief of the Earth's surface over which the airman passes must be as important to him as a knowledge of the depths of water is to the navigator. He must know both its form and the actual height of any point above a reference datum. In most European countries levelling operations have furnished this information in great detail, and we have to decide how this information is to be expressed. It is desirable that, so far as possible, the map should not only contain a statement of the altitude of different points, but it should also convey rapidly the idea of the form of the surface. Thus neither numbered points nor contours nor hill-shading (hachuring) wholly meet the case, and on the Continent at least an orographic system of graded colour tints is preferred, especially if the colours are so selected as to cause the high ground apparently to stand out from the lower levels, by employing greens, yellows, browns, red-browns, and reds in this order as higher altitudes are to be represented. The 2 miles to 1 inch (1 : 126,720) is the only map in this country as yet on this scheme, and the effect of relief produced by the scheme of colouring is greatly spoiled by mauve-grey tints being employed for the highest altitude instead of reds, and this was optically a mistake. But it seems that for use in aviation rather fewer and stronger tints are desirable than on the present map, and that the contour-lines which limit such tints might be a good deal stronger to aid in rapid reading. In this country at all events, very high altitudes are not met with, but in some parts the surface rises steeply, and contours fall close together. It is desirable to read the surface form easily, so as to follow valleylines, to recognize ridge

and hollows, to locate passes in hilly regions, to know the height at any time, and so select the safest and easiest route.

To attain such ease in reading, it has been proposed to employ a few strongly contrasted colours and repeat them at intervals, such that no confusion can occur, but it seems that a scheme of colouring to show relief sufficiently clearly can be obtained by a single series of graded colours. The use of shading to strengthen this effect is desirable, but perhaps should be restricted to the more marked features, and the shading as given by a light from the south would seem to give a more natural picture than the conventional direction of north-west.

III. Coming to the detailed information, a number of questions arise which it is primarily for the aviator to answer. Grouping them, we have such as relate to communications, settlements, special objects which are easily recognizable and therefore should be clearly marked, and written names and information. I imagine that some selection of the main roads will be desired to distinguish such as are most direct and easily recognized; railways and rivers likewise are readily recognizable.

In a densely settled country such as England, detached buildings will probably have to be omitted except where from their scarcity they afford useful indication. Large towns and their suburbs would be simplified by blocking in with a view of emphasizing the roads and principal objects.

Special objects, such as may be easily recognized and so afford assistance in determining location, will have to be shown more prominently than on the topographical map, where, though woods, lakes, etc., are conspicuous, church towers, factory chimneys, rocky hilltops, and places that are especially illuminated at night must come in for more considered treatment.

In the writing and in line work generally it appears likely that a somewhat bolder and stronger weight of line will be desirable than the skilled draughtsman is inclined to use when aiming at high technical excellence.

If the map is to be orographically coloured, this will be still more the case, and the employment of red, green, and blue writing seems to be of doubtful practicability. Many experiments will be necessary, and building up on a simple basis so as to get the essential information clearly represented appears more profitable than to add technical information to a map already full of detail.

Dr. PETAVEL said that his practical experience was too limited to enable him to add much to the matter under discussion. He wished, however, to emphasize the necessity for the maps to be as simple and clear as possible. The most useful features were the rivers, lakes, canals, and railways. The names of towns should be marked in large type, and, in his opinion, the French system of giving marginal sketches of buildings presenting marked characteristics was recommendable. He hoped it would be possible to differentiate, perhaps by colouring, between districts where good landing-places were frequent and those in which enforced landing would be dangerous. Possibly, as our knowledge of the atmospheric conditions became greater, danger signs could be marked on the maps to indicate localities where eddies and *remous* were frequently met with.

Captain W. V. NUGENT: The aero map of the Manœuvre area (produced) was prepared by the Geographical Section of the General Staff; it is entirely experimental, but I have been informed by airmen that it does give a fair representation. It is simply an adaptation of existing Ordnance Survey sheets on a scale of 4 miles to the inch with a great deal of detail left out. Other detail has been emphasized and exaggerated. The principal new features are the olive-green background, on which the roads show up white, this being presumably the appearance of the country seen from above.

As to the large number of small cross-roads shown, I have been told that a small farm track often shows up more distinctly than a first class metalled road in a case where the former is white and dusty and the latter muddy or tarred. We particularly wished to experiment in the best method of showing hill features, and in this respect the particular area represented is of not much use, as there are no great heights or ridges, and we were unable to try the relation of stump shading, brush drawing, or hachuring as compared with contours or the "layer" system.

With regard to the churches, only those with spires are shown, the ones with towers being so numerous in this part of the country that they could hardly constitute definite or useful landmarks. I agree with Captain Lyons that the streams have been hardly made sufficiently clear. The double lines of railway are actually shown by double lines; this is, I believe, useful.

Captain F. H. SYKES: I will try and say a few words from the aviator's point of view. I think there can no longer be any doubt as to the necessity of some system to aid aviators to find their way over long stretches of country, and to indicate suitable landing-places, danger points, etc. During the recent "circuits" and races ordinary maps were found to be quite inadequate, and although I am all in favour of educating aviators as map readers, I think they ought to be met halfway. Under present conditions the difficulties still to be overcome by both pilot and observer are great, especially on service, and any help such as that given by a clear map, but suited to the circumstances, should receive the most careful attention.

In peace a combination of the use of special aeronautical maps and a system of signals is the best method to employ. In war the signals would of course have been destroyed or obliterated.

Undoubtedly an international system as regards both would be very advantageous. It was wisely decided at the Brussels Conference that if the general system could be settled an experimental period would then be necessary to establish unknown factors, such as visibility, dimensions, etc. We have now had a portion of this period, but there is still necessarily a great divergence of opinion on the subject of maps and signals, and the recent great cross-country flights in England and on the Continent have not helped to the extent of justifying any decision as to a definite scheme involving great outlay. The signals established during the "circuits" had little real value as regards founding a permanent system.

The scale decided upon for the maps seems sound. Our 4-mile map is perhaps slightly on the small side, but a 2-mile one would be too large. As regards maps for military purposes, probably two scales will be advisable: a small one for long-distance reconnaissance, and a larger one, 2-inch or 1-inch, for detailed work.

I think it would be better to build up an aeronautical map upon points required by aviators rather than to eliminate detail from an existing map. The result in either case must be very clear, no useless detail, danger points accentuated by a special colour, etc. Hills are very difficult to portray. Personally I do not think any layer system that I have seen is suitable. I would suggest experiment with a system of distinct narrow smudgy lines to show the general trend of the crests of hills, and very clear figures to show heights marked at intervals. The shape of woods if accurately shown on maps is very useful as a guide to one's position. Railways and main roads are of course the most useful guides. It is advisable to differentiate between single and double lines. Sheets of water show up at a great distance. I do not think it advisable as yet to start

a system of signals to indicate meteorological conditions such as *remous*, etc. We know too little as yet on the subject. Some organization to utilise the experience gained by aviators and the requirements of cartographers should be started. Probably the various national aero clubs could co-ordinate this work best.

Captain P. Broke Smith, R.E.: 1. A system, such as that described by M. Lallemand, of forming an international series of maps of the different countries of the world to a uniform scale, and numbering the sheets in one series for the whole of the world, appears to be desirable. The system of landmarks proposed in connection therewith, by which the aeronaut can ascertain his position, reading the index numbers of the sheet of the international map and the relative position of the landmark over which he is flying in that sheet appears to be possible and worthy of adoption.

2. The task of the designers of aeronautical maps will be much facilitated if aeronauts are in the first instance skilled map readers. Otherwise there may be a tendency to produce maps of a "crude" nature rather than the highly finished product giving the very complete amount of information which it is desirable to obtain. By the use of suitable standard conventional signs much information can be given without "fogging" a map.

3. Some indication of the comparative levels and of the contour of the ground underneath is essential to the aeronaut. The contour of the ground affects very appreciably the air currents to a considerable altitude above the earth, and armed with a knowledge of the shape of the ground beneath and in front of him, the aeronaut may shape his course so as to avoid passing over country where he is liable to meet with treacherous aerial conditions, or may be forewarned of the likelihood of such conditions prevailing over country which he is bound to traverse.

If this indication of the contour of the ground can be accomplished, without preventing other detail from standing out sufficiently, by means of a gradually deepening system of ground colouring, the higher altitudes being indicated by the lighter shades of colour and the lower altitudes by the deeper shades of colour, or *vice versâ*, it would appear to be the most feasible method of accomplishing the desired result.

4. With regard to the detail of an aeronautical map.

(*a*) *Railways.*—Railways furnish a most valuable guide to the aeronaut, and should be clearly shown. An indication as to whether a line is single, double, or quadruple is also useful, and should be accomplished, if possible, by some other method than by indicating, say, a double line by two thick lines on the map, as this is liable to give the railway rather undue prominence, and to tend to throw other features into the background too much.

(*b*) *Roads.*—Experience shows that the more roads can be shown without obscuring the detail the better is it for the aeronaut. Some form of distinction between the principal roads and the by-roads is valuable, although all roads, even quite small tracks, stand out very distinctly when viewed from above. For instance, in many parts of England Roman roads stretching for miles in a nearly unbroken straight line across country may be of great importance to the aeronaut. Road junctions, the points at which minor roads debouch from major roads, curves in roads, etc., supply useful landmarks.

(*c*) *Woods.*—It appears inadvisable to rely too much upon the exact definition of the outline of woods as the means of enabling an aeronaut to recognize his position. It is certainly desirable to indicate the fact that woods exist by the use of the conventional green colour. But the outlines of woods are continually changing, and even a young plantation which has sprung up since a map was last printed may be just as noticeable from above as a well-established wood.

(*d*) *Water.*—The indication in blue of water, ponds, rivers, canals, in the usual conventional blue colour will always be valuable.

(*e*) *Towns and Villages.*—The positions of towns and villages, except in localities where to indicate them all would obscure the map, should be marked in black or in black shading.

(*f*) *Conventional signs.*—Simple and small conventional signs to indicate churches, monuments, etc., should be employed; these should agree as far as possible with those used in an ordinary map.

(*g*) *Prominent Buildings.*—The system adopted in one of the maps shown by M. Lallemand of printing on the margin of the map pictures of very prominent buildings, such as cathedrals, etc., which stand out when seen from above, and the recognition of which would be a valuable guide to the aeronaut, appears to be likely to be of value.

5. Special information of value to the aeronaut should be indicated and should embrace an indication of the positions of aerodromes, airship sheds, hydrogen stores, and also, if possible, places which are especially suitable for landing, or which are specially dangerous therefore. A system of conventional signs to indicate these several items should be evolved.

It appears desirable that the colour red should be reserved to indicate all features which are inimical to landing and which cannot be recognized as such from the air. Such are overhead electric power wires, telegraph lines, tracts of grassy ground, which from above appear to be smooth, but which in reality are very rough or covered with small bushes, etc., etc.; these latter may be indicated by light red shading over other detail. Marshy ground will be similarly indicated by light blue shading.

6. For the production of aeronautical maps, close co-operation between aeronauts and cartographers is necessary.

Mr. Bertram W. Cooper: I should like to urge the importance of a constant interchange of information between the cartographer and the aviator—the local aero clubs constituting a sort of clearing-house for information received from their members.

There seem to be at present two classes of aviators—those used to reading maps (*e.g.* naval and military men) and those unused to maps. It is a question whether the needs of these two classes are sufficiently compatible to make it worth while to try to meet them in a single map. If the latter class persists, a "crude" easily read map will be necessary for it—the expert map reader having his own line of development untrammelled by the novice.

In view of the almost total absence of reliable data as to adverse meteorological conditions, would it not be as well not to attempt to denote them on the present maps, but to have a sort of skeleton map, separate from the detailed map; upon which the aviator could insert data as to eddies and so forth as he came across them?

Mr. Eric H. Clift: With reference to important objects, it is advisable to considerably increase their scale relative to the general scale of the map, for instance, water of all kinds should be greatly magnified whilst keeping the exact shape, bends, etc. Weirs should also be shown. It is important that widths of rivers should be correct relative to each other. Gasometers are not of much use, as nearly every town in England has one; this also applies to ordinary churches, although certain of them on high hills, where the rest of the country is comparatively low, do assist. With reference to the method of showing hills, the opinion amongst aviators seems to vary considerably, but generally high ground shows itself only very slightly unless flying low and the high ground

is in the distance, the real use of knowing the height of the ground is for safety in misty weather. About three different depths of colour or shading seems to be all that is necessary for the British Isles. Railways—it would no doubt be an advantage if single or double lines of railways could be distinguished, but it must not be forgotten that light railways and tramways ought also to be shown in a distinctive manner, especially overhead electric, of which in future years there will probably be a great number, even on the main lines. It seems of great importance that junctions of railways should be very plainly shown. Objects of real importance seem to be large buildings, such as prisons, infirmaries, barracks, hospitals, asylums, watchhouses, cathedrals, etc. Cemeteries are also very distinctive. The ground plan is frequently as important as the elevation.

Reference has been made to marking good landing-places, but it must not be forgotten that what is good in winter may not be good in summer or spring. Landing at 60 miles an hour in a field of growing wheat may probably be as dangerous as landing in a quarry. It would, no doubt, be very useful if all woods could be shown in their correct size and shape, but, as already mentioned by one of the speakers, woods are constantly changing. I prefer to show the woods by a few individual trees, giving only a general idea of the outline.

Mr. W. Stanford: It seems to me this discussion has brought out the fact that a great deal of the information the aviator requires is already given on up-to-date Survey maps, if he is able to read them and appreciate the story they have to tell. The additional details that the aviator asks for might, I think, be embodied in existing Survey maps by means of an extra printing or printings, thus producing a special edition. The suggestion that the Survey map is too complicated for the civilian aviator, and that, therefore, a special simplified map should be produced for his use, is not, to my mind, worth consideration, and I feel sure it will not be the least important result of this discussion if it be made clear that aviators must be able to read and understand maps, and if a course of instruction in "map reading" becomes a recognized part of their training.

Colonel Sir Duncan Johnston: It seems to me desirable that a uniform scale for aeronautical maps should be adopted throughout the world, and that as far as possible the scale adopted should be one in existing use. I think that these conditions would be fairly satisfied by the adoption of a scale of about 1 : 250,000. In Great Britain and her colonies we have the 4-mile scale, which is almost the same as the 1 : 250,000, and in many countries maps exist on the latter scale. It is a convenient multiple of the 1 : 1,000,000 scale, and although somewhat smaller than the 1 : 200,000 scale map proposed by M. Lallemand, I think it probable that it would fairly answer the purpose.

We are much indebted to M. Lallemand for his valuable paper, which has given rise to this interesting discussion.

Colonel Close: There is a very general agreement upon many points. I think, for instance, that we are all of opinion that an international air map is a desirable thing, and that it follows that we should standardize the symbols. Also, as regards the scale, practical men appear to agree that 1 : 200,000 is convenient. 1 : 250,000, or practically 4 miles to the inch, is more usual in British dominions, but on the Continent 1 : 200,000 is a more acceptable scale. I do not personally think that we should produce two classes of maps, one for those who can read maps easily and one for those who cannot; I think there should only be one standard map. Much more discussion is necessary before any very general agreement is reached, but this agreement will be much facilitated by the admirable maps got out by the French authorities. We are much indebted to M. Lallemand and to those gentlemen who have so kindly attended this meeting

to give us the benefit of their practical experience as airmen. The solution of the question is, indeed, entirely in the hands of the practical man.

THE MACKAY-LITTLE EXPEDITION IN SOUTHERN NEW GUINEA.*

We referred some time ago (*Journal*, vol. 33, p. 93) to an expedition up the Purari river, undertaken by Mr. Donald Mackay, which, when the reports then to hand were despatched, was just beginning the ascent of the river beyond the farthest point reached by Sir W. Macgregor. We have now received a narrative of the expedition and summary of its main results from Mr. Mackay, as well as a more detailed account in the form of a journal kept by Mr. William S. Little, Mr. Mackay's companion during the journey. It appears that, while the venture was financed by Mr. Mackay, Mr. Little brought to its execution a considerable amount of previous experience in the wilds of New Guinea. The services of Messrs. Pratt and Eichhorn, as surveyor and collector respectively, were also secured.

The required stores and porters having been got together with a good deal of trouble, the former were sent by sea to the Purari in a schooner chartered for the purpose, while the personnel, after being conveyed as far as Yule island in the Government steamer *Merrie England*, and transported thence to the mainland in whale-boats, set out for the Purari (July 31, 1908) by the land-route along the coast, the sand-beach affording good walking for a large part of the way, though somewhat trying in the heat of the sun, while the crossing of the various creeks involved some difficulties. The travellers were accompanied during this part of the expedition by Mr. Bell, a resident magistrate who had just been transferred to the Gulf division, and was on his way to take up his new appointment.

Except during the first two days from Yule island the country was mostly low and swampy, with trees of stunted growth and mangroves. Going west, it was noticed that the native dress became more scant, and the people seemed of a lower type. Arrived at the limit of the Purari delta waters, all hands embarked in the Government whale-boats and canoes, and made the rest of the journey by water. The delta-lands are naturally low and swampy, with mangroves, pandanus, sago palms, nipa palms, etc. The canoes here had their ends cut away and quite open, apart from a bank of mud, making it necessary in rough water for one of the occupants to sit in the gap to keep the water out. After taking over the goods from the schooner (they were landed at one of the native "dobu" houses), the party proceeded up the river (August 15)

---

* Map, p. 556.

in the whale-boats and seven canoes. On the 18th the tidal influence ceased to be felt, and with it the swamps were left behind, while the usual Papuan forest country took their place. The river was here 475 yards wide, with a current of some 3 miles per hour. On the 21st the country is described as splendid—rich alluvial flats—and the river as a fine stream 1000 yards wide. Hills appeared on the banks, though higher up they retreated some distance from the river. Heavy rains were experienced, and owing to the powerful current it was difficult to make headway, especially in the rapids. Natives were met with, but friendly intercourse was only with difficulty established. On reaching Sir W. Macgregor's turning point, a base-camp was established at Biroe, and preparations were made to continue the journey on land, the "boys" being set to work making sago, of which a fair supply was met with. Mr. Bell, who had accompanied the expedition so far, now started to return (September 10), taking the whale-boats and canoes down with him.

The country ahead appeared difficult, so on the 11th Mr. Little made a reconnaissance, accompanied by Mr. Pratt, obtaining a view from a hill at some elevation above the river. A limestone country had now been entered, and the hydrography became exceedingly puzzling, streams frequently disappearing on a sudden beneath the ground. Rain continued to fall in torrents, but on the 23rd the two leaders made a move forwards. Their advance was soon stopped by a precipitous gorge (which they named Hathor gorge), and it was decided to turn back and attempt to cross to the south side of the river, a difficult matter in its swollen state. Rafts proved a failure, but the crossing was at length effected in canoes made for the purpose. A renewed start on the south side was made by Messrs. Mackay and Little, but the severe attacks of fever experienced by the former compelled a retreat once more. Mr. Little had, however, climbed a hill and obtained a view up the valley in a westerly direction. From the camp at the crossing-place he started again with Pratt, and this time pushed further ahead. The river was found to split into two branches, one from the west, the other from the north;* but the hydrography was still difficult to trace, several of the streams seeming to flow underground for considerable distances. Sago palms continued to be met with, giving a promise of the needed food-supply for the porters. Finally the whole force made a start together, and, the weather having now changed for the better, things looked somewhat brighter. At one point the party suffered severely, however, from want of water, having penetrated into a blind waterless valley from which it was necessary to retrace their steps. An important discovery was that of coal *in situ*, specimens having been previously seen in many of the creeks. It appeared to be of excellent quality. The party now

* Mr. Little says that the northern branch was named Piau and the western Elo, but the map sent by Mr. Mackay shows this to be incorrect, the western branch being the Piau.

PIAU RIVER EMERGING FROM THE MOUNTAINS.

COUNTRY WEST OF THE PURARI DIVIDE.

TYPES OF MR. MACKAY'S CARRIERS, REPRESENTING FIVE DIFFERENT TRIBES—TAPOTA, DOBU, IASSI-IASSI, TAUFIE, WAGIPA.

INTERIOR OF DOBU (TEMPLE), TORIPI.

left the basin of the Purari and entered that of the Kikori. Difficulties with the natives occurred, but by firing over the heads of their assailants the explorers at once put them to flight, and during the further advance the villages, several of which were found perched on elevated positions on the valley sides, were mostly evacuated in advance. Some of the houses were of a considerable size, and gardens were now seen, though lower down the river cultivation had seemed entirely absent.

On the 10th the weather became very cold, with a penetrating mountain fog. As it seemed impossible to advance in a westerly direction, Messrs. Mackay and Little started on the 11th on a trip to the top of the southern range, in order to see if it might be possible to push south to the coast by land. A good view was obtained on the 13th, showing to the south a succession of parallel ranges, while a little east of south a very prominent double mountain stood out. To the west the view was blocked by a large three-peaked mountain. No sign of a break in the nearer hills could be seen, but behind the low part of the range there appeared to be a huge funnel-like depression, leading to the conclusion that the water must get away underground. The limestone in the immediate neighbourhood was a mass of holes and caverns, making travel a matter of difficulty. It being evidently a matter of risk to push south across the parallel ranges, the decision was arrived at to return, though before starting back a short trip was made up the valley towards the head of the northern range, the route leading past several villages, whose natives, as usual, fled on the approach of the travellers. In this direction the country seemed to change and become less rough, no limestone being seen further ahead. During the return journey the natives in the upper part of the valley became more friendly. After reaching the navigable part of the Purari, which continued to be swollen by heavy rains, canoes were made, and the river was descended in them to its mouth.

The following notes are condensed from Mr. Mackay's paper:—

Geography and Geology.—The whole of the area explored showed a succession of steep valleys and knife-topped ridges, with very little level ground, and it was evident that the country is being rapidly eroded. From MacGregor's farthest to the turning-point the prevailing rock is limestone, apparently of considerable thickness. Coal-bearing sandstone, and slate probably of lower Palæozoic age, were also found, while water-worn pebbles of basalt, probably indicating basalt-capped mountains, were collected on the upper Purari. In the opinion of the Rev. J. Milne Curran, who examined the specimens, a faint venation on a weathered piece of the coal possibly indicates *Glossopteris*, in which case the New Guinea coal-measures may prove to be an outlying basin of the *Glossopteris*-bearing beds of India and Australia. The slate rock was not unlike, in general character, the Silurian slates of New South Wales. No trace of gold or other metals was seen.

Natives.—At Biroe, Sir W. Macgregor's farthest point, the natives were, physically, of a good type, with well-developed limbs and chest. Their average height is probably about 5 feet 1 inch, and their colour differs from that of the Delta natives. The men fit a small cylinder through the nasal *septum*, from each end of which a thin spine of bone extends some inches. They wear arrow-proof bark belts, and while some use a bunch of leaves in place of a loin-cloth, others wear cloth made of the inner bark of the paper-mulberry. As ornaments they have earrings, armlets, and necklaces, and in some cases suspend from their necks objects like a human hand or jaw, feet of the scrub-hen, crabs' claws, etc. They use stone tomahawks, set at an angle of 65° to the handle, and as weapons bows and arrows, the latter bone-pointed and barbed for war, while for shooting pigs the point is a flat piece of bamboo 9 inches long and half an inch broad in the middle. The fish-arrow has four separate points. The bows are made of the wood of the black palm, and the string is a thin strip of bamboo. Farther west, the Piau warriors who opposed the travellers carried big bark shields (with a spike for fixing into the ground), bows and arrows, and also lances of palmwood about 8 feet long, pointed with the leg-bone of the cassowary, and probably used for stabbing. Similar weapons had not been seen before. A Piau house which was occupied by the party was raised on piles 10 feet above the ground, the ascent to the door being by a pole in which nicks had been cut for footholds. The house was about 40 feet long by 20 broad. In another village, built on a ridge and accessible on one side only, the largest house measured 105 feet by 25. It was supported in the middle by a pigsty, and, though divided into many compartments, had no windows. The cultivation hereabouts consisted of yams, beans, bananas, sugar-cane, tobacco, taro, ginger, potatoes, and cucumbers; but the making of sago is the chief industry.

Climate.—About the Purari delta a monsoon wind blows nearly every day from the south-west for six months, but it reaches no distance inland. During the journey it rained for some time almost, if not quite, every day. A fall of 3 inches was registered in a single night, and on another occasion 1 inch in fifteen minutes. For seven consecutive days the amount was $11\frac{3}{4}$ inches. On the Piau river the stars were seen for the first time in a month, and near Hathor gorge the moon was seen for the first time since reaching the Purari. On the Thukuri the thermometer frequently registered 90° Fahr. at 2 p.m., but at the farthest west, at an altitude of 3000 feet, cold was experienced, and extra clothing was needed at night.

Fauna and Flora.—Leeches were constantly a trouble, and mosquitoes, flies, and moths were everywhere. The Purari contained alligators; and cuscus, bandicoots, and opossums were seen up to its headwaters. The cassowary seemed, from the tracks constantly seen, to be common. Other birds were scrub turkeys, Gowra pigeons, white cranes, hornbills, swallows,

and kingfishers. Iguanas appeared to be plentiful, the natives using their skins for a variety of purposes.

The whole country was wooded, and sago swamps were found from the Purari delta to the Styx river. As the former river was ascended, the nipa palm was replaced by the bread-fruit tree. The pandanus trees about the divide were of exceptional size. A few trees, far apart, seemed to closely resemble the Norfolk island pine.

TRIPOLI.

By Dr. ADOLF VISCHER.

THE outbreak of war between Italy and Turkey, and the Italian expedition for the occupation of Tripoli, make it advisable to briefly take stock of our present knowledge of that vilayet of the Turkish Empire—the last remnant of the once extensive African possessions of Turkey—from the points of view both of its geography, its past relations with the rest of the world, and the economic conditions on which its future profitable exploitation must depend.

Tripoli is not a geographical unit, but consists of several regions which differ in many important respects the one from the other. These regions have, in common, only the political bond supplied by the Turkish rule. These different countries are: firstly, Tripoli proper, or the territories along the coast from the Tunisian frontier to the Gulf of Sidra; secondly, the tableland of Cyrenaïca, which forms a projection into the Mediterranean and is bounded southwards by the Libyan desert; and thirdly, Fezan, the southern province of Tripoli—a collection of oases separated from the coast region by the stony desert, or Hamada-el-Homra.

The Tripolitan coast is low, rocky, or sandy, and offers but few natural ports. The harbour of Tripoli is the only one of importance, and even this is not protected from the north-east gales, and in rough weather it is no rare occurrence for steamers to be unable to approach the port. From the coast inwards, to a distance of 40 to 80 miles, runs a plain, called Jefara, which has all characters of a steppe. Only a small strip of land along the coast combines a sufficient rainfall with sufficient fertility to enable it to support vegetation, and this extreme limitation of the area from which the country draws its resources must exercise an important influence on any military operations carried on within it. Where it surrounds Tripoli, this cultivated strip is about 3 miles wide, and is there called the Meshia. The rest of the plain is covered by dunes, the material of which is brought from the Sahara by the south wind or *gibli*. Between the dunes are camel pastures and very few patches of cultivated land. The plain is intersected by wadis, or river-courses, which in the winter-time bring the water from the mountains to the sea. The direction of these wadis is from south to north. The part of the plain which is

nearest the mountains is very stony and dry, and is covered with the products of erosion brought down from the mountains.

The mountains, which are at a distance of 40 to 80 miles from the coast, are the continuation of the Tunisian and Algerian Tell. Beginning from the Tunisian frontier, the first group of mountains is the Jebel Nefusa, then follows Jebel Yeffren. Still further east and directly south of the city of Tripoli, is Jebel Gharian, which, in clear days, can be seen from the southern border of the Meshia; Jebel Tarhuna forms a projection which runs out nearer to the coast south of Misurata. These mountains ascend very steeply on their northern border, but to the south they have only a slight inclination. The steep ascent from the north is of some importance, as it entails one of the difficult passages on the routes between Tripoli and the interior. Some of the mountain regions, especially Gharian, are well cultivated with fig and olive trees, vines, and corn. In Gharian we find the highest elevation of the country—Jebel Tekut, an extinct crater, reaching an altitude of 2800 feet. Southwards, the country becomes more and more stony and dry, till it reaches the Hamada-el-Homra, a flat rocky plateau about 40,000 square miles in extent, covered with small red stones.

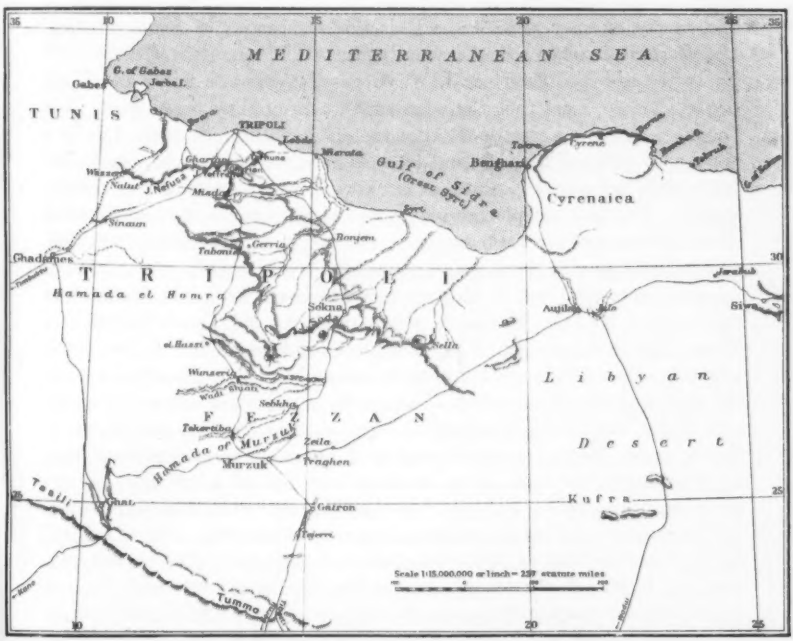
The climate of the Jefara and of the Jebel is Mediterranean, with winter rains from November to February. At Gharian, snow is not uncommon. The winter rains can be depended on only as far as the Jebel. South of it, rain is rare and irregular. At Mizda—as we are told by a recent traveller—there has been no rain for the last thirteen years.

Tripoli proper is inhabited by sedentary Berbers, who dwell in the coast towns and in the Jebel. They cultivate the soil or earn their livelihood as artisans in the city of Tripoli, their total number being not more than 300,000. The Arabs live as nomads in the steppes; the different tribes being at one moment in the Jefara, at another in Cyrenaïca or Fezan. Their number is difficult to estimate, but it hardly exceeds 50,000. Jews, to the number of 11,000, live in Tripoli city and in Gharian, where a very old Jewish colony exists, which owes its origin to a Jewish immigration in the days of the Roman rule.

Tripoli city has a population of about 50,000, of which 4000 are Maltese and Europeans. The principal industries of the place are metal and leatherwork, and carpet manufacture, while several Esparto grass presses belong to European firms. The Esparto grass is brought to Tripoli from the mountains. A good deal of sponge fishing is carried on by Greeks in Tripolitan waters, but this industry affects the country but slightly.

At the southern border of the Hamada begins the land of Fezan, a collection of oases. Fezan is an outlier of habitable country projecting into the Sahara, which surrounds it on the east, south, and west. Its southern border is formed by the Tummo mountains, whilst at its south-western corner rises the Tasili plateau. Fezan is intersected by wadis, which have a course from west to east. The principal of these is Wadi

Shiati. In the wadis we find the few cultivated patches, the rest of the surface consisting of desert and dunes. The population, which may be estimated at some 40,000, is scattered over about eighty inhabited places. The Fezanis have to maintain a hard struggle against the desert, which threatens to invade their oases. The land does not possess pasture grounds large enough for its needs, and this compels the Fezanis to drive their cattle to pasture in the steppes of the great Syrt. The fruits of the date palms they sell to the Bedawin, who come at the end of the summer, bringing in exchange corn and barley. The resources of the land



SKETCH-MAP OF TRIPOLI AND ITS DEPENDENCIES.

are not large enough to nourish its inhabitants, and this is the reason why a great number of Fezani are to be found in Tripoli and Tunis as servants and artisans. These have, however, a great affection for their country, and always return to Fezan after some years.

Fezan is the old land of the Garamantes. During the wars which raged interminably over the country, the majority of the original inhabitants disappeared, and those who remained mixed with the new tribes arriving from the south or the north. In the west, we find the Tuareg at Ghat; while at Tejerri, the inhabitants are Tubbus. On the other hand, the people of Gatrun have all the characteristics pointing to Bornuan

origin, whilst at Wadi Shiati and in Murzuk, there are Berbers and Arabs. The Negro is to be found everywhere; he appeared with the opening of Trans-saharan trade, and with the formation of slave colonies, founded in Fezan by the rulers of the Bornu empire for the purpose of working the salt and potash mines and of facilitating the passage of caravans. Murzuk, the capital, has about 3000 inhabitants, and is an important intermediary station between the Mediterranean and Lake Chad.

Cyrenaïca, the eastern part of Tripoli, is a great projection of land between Egypt and the Gulf of Sydra. It includes the country from the shores of the Mediterranean (between the Gulf of Solum in the east and the south-eastern corner of the Gulf of Sydra south of Benghazi), and the northern border of the Libyan desert.

In the words of Professor J. W. Gregory, "a section north and south across Cyrene shows that the country consists of three main levels; on the north is a low, narrow coastal plain, which ends inland at the foot of a steep cliff. The cliff is the front of a platform, the surface of which rises from 1000 feet above sea-level at its northern edge to 1300 feet further inland. This sloping platform extends inland for a width of 5 miles. Then follows another steep ascent to the height of Cyrene, of 1900 feet, and behind this cliff lies a wide undulating plateau, which gradually rises inland to over 2500 feet." Most probably the number of inhabitants does not surpass 150,000, Benghazi, the capital, having about 12,000 and Derna half that number. They include both Berbers and Arabs. The products of the soil are barley, wheat, and maize, but more important are the products of cattle-rearing. The cattle is exported oversea to Crete and Malta, but mostly overland to Egypt. The climatic conditions of Cyrenaïca are Mediterranean in character, but show great variations, and for this reason the yield of the crops is very irregular. Four years ago the winter rains failed, and food was being imported into Benghazi owing to the complete failure of the crops in western Cyrenaïca. There is little doubt, however, that it forms the most valuable portion of the vilayet, and that which offers most advantages for permanent settlement, even if the reports of some travellers as to its fertility and plentiful rainfall should prove exaggerated.

The harbours, both of Benghazi and Derna, are indifferent, and it is on the eastern coast of Cyrenaïca that we find two natural harbours of the highest value: Bomba and Tobruk. Bomba is inferior to Tobruk, as the surrounding country is waterless, and the coast-line hereabouts shows signs of oscillation. But all visitors agree as to the excellent qualities of the harbour of Tobruk. The length of the Bay of Tobruk is more than 2 miles and its average width is little less than one mile. It is open only to east winds, which are but rare in that region. Schweinfurth places Tobruk on a level with Bizerta as regards security. The distance from Brindisi to Tobruk is only two-thirds of that between Brindisi and Alexandria, and Schweinfurth has calculated that railway communication

between Tobruk and Alexandria, combined with a steamship service from Brindisi to Tobruk, would shorten the voyage to India by 20 hours. Tobruk is only 80 miles distant from the Egyptian frontier.

Tripoli, like the rest of North Africa, was incorporated in the Roman empire at the time of its greatest extension, and also shared the fate of North Africa in general, in being brought under the sway of the Mohammedan power in the seventh century A.D. It was not till the sixteenth century that the Ottoman Turks established their rule in the country, and even after that time, the Beys were for some time almost independent of the central authority. Since 1835 Tripoli and Fezan have formed the Turkish vilayet of Tarabulus-el-Gharb, Cyrenaïca being a sub-province or Mutessariflik, with an administration responsible direct to Constantinople.

The political boundaries have never been precisely defined, with the sole exception of that on the west between the coast and Ghadames, which was the subject of an agreement with France in 1910. South of Ghadames, the rival claims of France and Turkey are still unsettled. Within the last few years, the Turks have developed great activity in Fezan, and have established their outposts as far as Bardai in Tibesti, Bilma, and Aïr.

There are no railways in Tripoli, communication with the interior being almost entirely by camel caravans, in North Africa called *gafla* (*kafila*). The caravans follow a number of time-honoured routes. From Tripoli city, three important routes go south. One passes by Nalut and Sinaun to Ghadames and thence to Timbuktu. Two reach Murzuk: the one, which is the more western and the shorter, is the more difficult, as it crosses the Hamada-el-Homra and is waterless for 5 days. The other, more eastern, route describes a slight curve, and reaches Murzuk *viâ* Bonjem and Sokna. This is the route which is adopted by the fortnightly courier from Tripoli to Murzuk, the distance being covered in 18 days. From Murzuk, two routes cross the Sahara: the one, by Ghat and Aïr, to Zinder and Kano; the other, by Tejerri *viâ* Bilma, to Bornu. An old route runs from Murzuk in a north-easterly direction to Sella, Aujila, Siwa, and finally to Egypt. From the Cyrenaïca, a route leads south to the oasis of Kufra and thence to Wadai. This route has never been covered in its whole length by an European. Gerhard Rohlfs made a bold attempt to accomplish the journey, but only succeeded in reaching Kufra, where his caravan was robbed.

A few words may be permitted on the Transsaharan trade. In former days, when West Africa and its rivers were unknown to Europeans, Tripoli used to be the terminus of the traffic across the Sahara. The goods which arrived from Hausaland and the Niger countries were ostrich feathers, ivory, metals, and skins and slaves. In exchange, the productions of European markets were taken south. Since the middle of last century, this trade has gradually declined. First, the slave traffic was stopped by the European representatives in Tripoli and by the Turks. It

has been said that slave traffic is still going on on the Benghazi-Wadai route, but it is difficult to test the truth of such assertions as, in any case, the traffic is carried on secretly. Slaves were the most remunerative of the articles dealt with in the Transsaharan trade.

Then came the advent of European administration in Hausaland and the Niger countries. This, and the occupation of Tunis and Egypt by France and Great Britain, drove all independent tribes to the eastern Sahara, where they began to molest and rob the caravans. Further, the shipping facilities were increased on the rivers Niger and Benue. The goods from Bornu and Kano were sent down to the Gulf of Guinea, whence they reach Europe in two weeks' time. The new route was safer, shorter in time, and less expensive than the 2000 mile journey across the Sahara. A few figures may illustrate the decline witnessed during the last few years. The trade in ostrich feathers, valued in 1890 at £250,000, had fallen by 1905 to £12,000; while the figures for ivory are: 1890, £25,000; 1905, £1500. The value of the goods sent to the south was £400,000 in 1894, but in 1906 only £70,000. To-day, it is only the route from Benghazi to Wadai which is somewhat frequented, although it is a most difficult one. But with the coming occupation of Wadai by the French, the trade of that country will probably take a western and southern direction.

Although the Sahara has lost its importance in the world's trade, it is and will be crossed by numbers of pious Moslems from the Mohammedan West African countries who undertake the pilgrimage to Mecca. The Transsaharan trade is practically at an end, but this spiritual or intellectual communication between Tripoli and Nigeria, through these pilgrims, remains.

The prospects of Tripoli in the future depend solely on agriculture. The hopes of mineral wealth in the soil are based on no solid ground; on the contrary, Prof. Gregory and Mr. Pervinquière are definitely pessimistic about mining prospects in Cyrenaïca and Tripoli respectively. No doubt something could be done by an enlightened administration to increase the fertility of the soil. But much capital would be required for construction of artesian wells and irrigation works, and there is great doubt whether the sanguine hopes entertained in some quarters are likely to be realized. When I was in Tripoli last year, a Frenchman obtained a concession to construct an artesian well outside the Meshia, but he abandoned the work when he had bored to a depth of 240 feet without finding any trace of water.

Some of the Roman writers speak in terms of high praise regarding the fertility of Tripoli, and many at the present day hold the opinion that the country may yet revert to its old glories under European guidance. But the prospects are less favourable when we consider the results of the careful investigations of Prof. Gregory, which lead him to the conclusion that the accounts of the ancient authors were not a little exaggerated. Then again, some scientists hold that the present miserable condition of the country is due to climatic changes; further, it is obvious to the

most casual observer, that the migrating dunes which have been allowed to invade the Jefara are a serious hindrance to any agricultural undertaking. Within a very few minutes' walk of the southern border of the Meshia, dunes can be seen rising to a height of about 50 feet.

Tripoli is known only in its broader features, and we may still class some parts of Fezan and of Cyrenaïca amongst the unknown lands of Africa. What we know of the country we owe to the great travellers of the beginning and middle of last century who visited it—to Ritchie and Lyon, Denham, Richardson, Barth, Rohlfs, and Nachtigal. The most conspicuous is undoubtedly Barth. The works of these men contain even now the best information about the land. During the last fifty years, the interior of the country has been visited only by very few Europeans. No European has reached Ghat since Erwin von Bary died in that town in 1877. Pervinquière, who made a journey to Ghadames in the spring of this year,* was the first European visitor for forty years. Murzuk, in the last ten years, has been visited by two Europeans only. Since 1880, a special firman has been required for any excursion extending beyond the immediate surroundings of the city of Tripoli. Considering the insecurity in some parts of the country, and fearing that any accident which might happen to a traveller would cause friction with a foreign power, the Turkish authorities thought it wisest to stop travel altogether. Apart from the coast, the country has never been surveyed, and the existing maps are based mainly on the route-sketches of different travellers.

BOOKS OF REFERENCE.

BEECHEY, 'Proceedings of the Expedition to explore the Northern Coast of Africa.' London, 1828.

DENHAM, 'Narrative of Travels and Discoveries.' London, 1828.

BARTH, 'Travels and Discoveries in North and Central Africa.' London, 1857; 2nd edit., 1890.

NACHTIGAL, 'Sahara und Sudan.' Berlin, 1879.

MATHUISIEULX, 'A travers la Tripolitaine.' Paris, 1903.
Gives an account of a journey to Jebel Gharian and to Lebda.

H. S. COWPER, 'The Hill of the Graces.' London, 1897.
An account of a journey to Jebel Gharian and Tarhuna, and to Lebda, with investigations of the megalithic ruins.

H. VISCHER, 'Across the Sahara from Tripoli to Bornu.' London, 1910.

JAMY BEY, 'Ghat and its Surroundings.' *Geographical Journal*, August, 1909.

E. BANSE, 'Tripolis und seine Meschia.' *Petermanns Mitteilungen*, vol. 54, 1908.
A very good description of the city of Tripoli and its immediate surroundings.

E. BANSE, 'Der arabische Orient.' Leipzig, 1910.
An excellent *résumé* of information on the Barbary states.

MINUTILLI, 'La Tripolitania.' Turin, 1902.
A description of Tripoli based on previously published works.

MINUTILLI, 'Bibliografia della Libia.' Turin, 1903.
An exhaustive bibliography of Tripoli down to 1902.

* See *Journal*, September, p. 317.

Dr. Georg Schweinfurth, "Una visita al porto di Tobruk." *L'Esploratore*, 1883, p. 207.

Th. Mommsen, 'The Provinces of the Roman Empire.' London, 1866.
Deals also with the African provinces Tripolitaina and Cyrenaïca.

J. W. Gregory, 'Report on the Work of the Commission to examine the Territory proposed for a Jewish Settlement in Cyrenaïca.' London, 1909.
A scientific investigation of the agricultural conditions to the country.

THE EGERTON MAP OF EARLY AMERICAN DISCOVERIES.

By ORVILLE A. DERBY.

The reproduction in the July number of the *Geographical Journal*, 1910, of a hitherto unknown, or with difficulty accessible, map preserved in the British Museum must be hailed by all students of the history of early American discovery as a most important contribution to the subject. Its value will, however, be greatly enhanced if, as seems possible, its authorship can be determined more definitely than is done in the learned accompanying article by Dr. J. Denucé, which simply states that it is extracted from an atlas belonging to the Egerton Collection (No. 2803), which is attributed to an unknown Italian cartographer who made use of both Spanish and Portuguese prototypes in its compilation.

A careful study of the map in connection with other cartographic and written documents of the time suggests the hypothesis that instead of being an Italian compilation, it is rather an Italian copy of the work of a Spanish cartographer, possibly Andrés de Morales, whose map was considered by Peter Martyr and by various witnesses in the Diego Columbus—Pinzon suit as the best that had been made in Spain up to that time (1513–1516).

Combining the various references to the Andrés de Morales map, it may be taken as certain that it presented the following characteristic features :—

1. A representation of a portion of the Brazilian coast to the south of Cape St. Roque, based on the Portuguese map known to be in the possession of Bishop Fonseca, for whom Morales worked. This was doubtless a copy of a map made originally by some member of the Portuguese expedition of 1501, which had already been copied in the Canerio and Kunstmann II. maps compiled in Lisbon shortly after the return of that expedition. Peter Martyr, who reports having seen this map in the collection of Bishop Fonseca, remarks that Amerigo Vespucci was said to have had a hand in the making of it. It is highly probable that this map had been taken from Portugal to Spain by Vespucci himself.

2. A representation of the coast from Cape St. Roque to the Gulf of Pariá, based, as Morales stated in 1513, on information obtained directly from Vincente Yanez Pinzon and Diego Lepe, and therefore different from that given by Juan de La Cosa in his map of 1500, or at least not obtained at second hand from this document.

3. A representation of the coast from Pariá to Maracaibo in which the map made by La Cosa of the discoveries of the Hojeda expedition of 1499–1500 would be considerably improved in delineation and enriched in nomenclature by the results of later expeditions, in some of which Morales had taken part.

4. An entirely new feature, as compared with the earlier maps that have come down to us, consisting in the delineation of the coast to the west of Maracaibo, giving the combined discoveries of Bastidas, Columbus, and Solis and Pinzon, up to the farthest northing attained by the latter on the coast of Yucatan. With

regard to the discoveries on the Central American coast, Morales stated in 1513 that he had seen (and presumably copied) the map resulting from them.

5. A greatly improved and practically original representation of the island of Cuba, which had been circumnavigated in 1508 by Morales himself for the express purpose of mapping it.

All of these characteristics are found in the Egerton map, and it seems extremely improbable that this would be the case if this map was not derived directly from the one compiled by Andrés de Morales on the basis of his own observations; of the partial maps and information obtained by him from various explorers; and of the documents collected by Bishop Fonseca, for whom the compilation was made. There is, therefore, a reasonable presumption that what we have preserved is a copy (subdivided into three sheets, and with a certain Italianization of the nomenclature) made by the compiler of the Egerton atlas from a copy of the original Morales map that had been transmitted to Italy.* In this case it would be subjected to the alteration incident to two processes of copying, but these presumably would be of comparatively slight importance. The essential point is that it may be presumed to be free from intentional alteration, and that it thus represents the state of official Spanish knowledge of America in the interval between the conclusion of the exploration of the Central American coast by Solis and Pinzon in 1508 and the sensational discoveries of the Pacific by Balboa, and of Florida by Ponce de Leon.†

* It would be quite natural that, in view of Peter Martyr's commendation of the map, the pope, to whom the Second Decade was addressed, should have requested a copy from Bishop Fonseca; and such a request, if made, would undoubtedly have been satisfied.

† This observation will apply also to the map of the North Atlantic in the National Library of Paris recently reproduced by M. Denucé (*Les Origines de la Cartographie Portuguaise et les Cartes des Reinel*, Gand, 1908), and attributed by him to the Reinels before their passage, in 1519, from the service of Portugal to that of Spain. The Spanish portion of this map (the Atlantic and the Caribbean coast) covers precisely the same ground as the corresponding part of the Egerton map and represents no discoveries of later date, since the continental section figured north of Cuba is evidently based on an earlier Portuguese prototype (Cantino or Canerio) rather than on Spanish explorations (Ponce de Leon, etc.). The two maps differ materially in the topographical representation of the larger Antilles and the coast section west of Maracaibo which both add to the earlier maps (Juan de la Cosa, Cantino, Canerio, and Kunstmann II.), as well as in the corresponding nomenclature, which is about equally rich in both. In the first respect the Paris map is decidedly superior to the London one, especially in the configuration of Cuba, which is full of names, whereas in the latter map only that of the island is given. In the matter of nomenclature the names on the Paris map are almost wholly of Spanish origin, while on the London one there is a goodly sprinkling of Indian ones, including, as Denucé has remarked, a number that are characteristic of the 1508 expedition of Solis and Pinzon, from which Morales stated that he obtained much of the information embodied in his map. Evidently the compilers of the two maps used different prototypes for this portion of their work, and if Cuba alone is considered, the Paris map might be presumed to be nearer to the original Andrés de Morales map than the Egerton. This supposition, however, is not supported by the other portions of the map.

In the Paris map the topographical drawing of the section from Maracaibo to Pariá is greatly improved, as compared with the known preceding maps, but it is distinctly different from that of the Egerton document, though not inferior to it in quality. Singularly enough, no names are given on the mainland on this section. From Pariá to the southern border of the map near Cape St. Roque, the conventional character of the drawing and the absence of names shows that the Cantino or Canerio map was used as a prototype. In the extreme north the drawing and nomenclature

Considering the map as of Spanish origin based on the most authentic information obtainable in Spain at the time, we may venture to go somewhat farther than Dr. Denucé felt authorized in doing, in the study of the history of discoveries along the north-east coast of South America.

In this portion of the map the Spanish and Portuguese discoveries are united at Cape St. Roque, which figures as "sanlique." From this point southward the sixteen names on the coast-line coincide with those of two pre-existing Portuguese maps (Kunstmann II. and Canerio), with, except in a single instance, such slight orthographic changes only as may be attributed to the double transcription, first by a Spanish and later by an Italian hand. The exception, however, is noteworthy. A little to the north of Cape St. Augustine three Portuguese maps have a locality name, "Santa Maria de Rabida," "Rabeda," or "Rapida," which the Spanish author seems to have taken as a reference to the famous sanctuary connected with the name of Columbus, and so intentionally changed it to "Santa Maria de Colon." In this case neither the position nor the orthography justifies the hypothesis that this change was made with the intention of reviving and perpetuating the name "Santa Maria de la Consolation," given by Pinzon to his landfall. In confirmation of this view may be cited the fact that he retained, in the abbreviated form of "Santa Maria," the other saintly name, still farther to the northward, to which the Portuguese had attached a reference to an incident of their voyage (probably the taking of water in fear of an attack from the Indians) by adding the qualification of "de aguadia" (of the watering-place) in one version of their map, and of "datalaya" (of the watch tower) in the other.

Being in possession of an authentic Portuguese map of the discoveries on this coast, it is strange that the author of the Egerton document did not perceive that the large island figured by Juan de La Cosa as having been discovered by the Portuguese, was to be substituted by the coast-line represented upon it. In retaining this island he gave it, apparently on his own account, the name "insula de S. Joanne baptista," which does not appear in any other known cartographic document except the map of the world contained in the same Egerton atlas. Another Spanish feature of this dominantly Portuguese section of the map is the name "S. leo insula" given to the Fernando Noronha group of islands. This had figured on the Cantino map of 1502 with the name "Quaresma," * but had been eliminated in the three later and more detailed maps that preceded the return, in 1504, of the second Portuguese expedition to the Brazilian coast. Its presence on this Spanish map may perhaps be due to an independent discovery, since it would almost certainly have been sighted by Solis and Pinzon on the return voyage of the 1508 expedition, if, as reported, they left the coast at Cape St. Augustine.

In the purely Spanish section of the north-eastern coast-line the Egerton map gives forty-seven names between "sanlique" (St. Roque) and "bocco del drago,"

---

to the north of C (abo) Razo are essentially identical with those of the signed Pedro Reinel map of 1504, but with the addition of about half a dozen names of no particular significance. To the westward of this cape a considerable stretch of coast is figured, but without names except in the extreme eastern part. Amongst these names "Ilhas de Joha exteuez" (João Estevez) and "C. de Bretoes," presumably indicate Portuguese and French voyages subsequent to those of the Corte-Reals, of which no other record has been preserved.

* Owing to an easily explained confusion in the reading of the first two letters, this name has been given as "Anaresma," a word unknown in the Portuguese language, by various students of this map.

which is ten in excess of those on the corresponding section of the La Cosa map, from which a considerable number of names (perhaps even more than ten) have been lost by two large rents in the parchment. In his comparative study of the nomenclature of the two maps Denucé finds in this section only eight names that can be considered as identical, or as variants of the same original. Of these the most significant are " c. de s. maria " (Cape Santa Maria) and " riuo di croce " (River of the Cross). The former is doubtless the contracted form of the name " Santa Maria de la Consolation " given by Pinzon to his landfall, and its abreviation probably indicates that Pinzon took no personal part in the making of the map; the latter corresponds to the " river where a Cross was found " on the La Cosa map, and probably records an incident of the voyage of Lepe, who found the mark of possession planted by his predecessor.

As on the La Cosa map, the almost total lack of the five names given in the land grant of 1501 to characterize the territory ceded to Pinzon, is remarkable. Of these the map only gives " c. de s. vincentio " (Cabo de San Vincente, not given on the La Cosa map), and the above noted " Santa Maria." As will be shown farther on, Pinzon evidently became indifferent to his concession shortly after it was granted, but in the brief interval between his return to Spain and the date of the grant he certainly would not have been indifferent, and would presumably have insisted strongly on the insertion of these characteristic names in any map to which he made any direct personal contribution. As it was exactly in this interval that the American part of the La Cosa map was drawn, and that, presumably, Morales collected his information regarding the 1499–1500 voyages of Pinzon and Lepe, the inference is clear that the results of these two voyages recorded in the two maps must have been communicated principally by Lepe or some of his associates, or by a subordinate member of the Pinzon party who had no personal interest in the preservation of the names given by the chief.

The most important and at the same time the most significant difference between the two maps is in the representation of the two great breaks in the coast-line corresponding to the two greatest topographical features of this section of the coast, the gulf of Maranhão and the mouth of the Amazon. Both in its position and outline the first of these is figured in substantially the same manner in the two maps, but in the case of the second, the Egerton map shows that its author had detailed information which presumably was not possessed by his predecessor, since it is hardly probable that it would have been purposely left out. The main features of this information can be deduced from the map itself as follows :—

An exploring party entered the mouth of the Amazon and coasted for a considerable distance (some of the chroniclers say seventy leagues) along the north shore, giving names to a number of points. In so doing a free use was fortunately made of the Saints' Calendar, and this enables us to establish the chronology of the up-stream part of the voyage. The significant names commence on the ocean coast just to the southward of a river mouth which doubtless represents the Araguary. The first one, " costa de paticuras," * is important as the first Indian name to figure on the eastern coast of South America. The names with a date significance that follow are—

* This name is given with the form of " Paricura," in Peter Martyr's First Decade, and on the Freducci and Turin maps; " Paricuria " on the Maiollo map of 1519 and 1527. The companion name " Camomoro " given by Peter Martyr does not figure on any known map and, as Denucé has shown, is probably one of the numerous confusions made by that chronicler, its true location being on the Central American coast in the form of " Canorona," or some of its variants.

Costa de S. Sebastiano	January 20.
S. Maria Candelar (Purification)	February 2.
S. pedro (S. Pedro Baptista)	February 5.
S. antonio (de Amanduala)	February 6.
S. gregorio	February 13.
S. benedicto	March 21.

At the southern entrance of the gulf is "San luca," which, if read "San Lucas" (October 18), does not combine with the other dates; if "San Lucio" (April 15), it may mean that this point was passed, on a southward voyage, after the exploration recorded in the other dates. Another hypothesis is that it may mean "San Lucar," the Spanish port from which many of the early expeditions sailed, and that it thus has no date significance.

The dates above tabulated give a concordant sequence which does not coincide with those attributed to the 1499–1500 voyages of Pinzon and of Lepe. The name "Santa Maria de La Consolation" given by Pinzon to his landfall on the coast near Cape St. Roque is usually interpreted as indicating Purification day (February 2) as the date of his discovery, and his other authentic names taken from the Calendar accord well with this interpretation. Thus Rostro Hermoso (Feast of the Veronica), February 4, Santa Maria de La Mar Dulce (Annunciation) March 25, and San Vincente, April 4.

These two lists of dates are irreconcilable, and we are thus forced to the hypothesis that the Amazon data were gathered by an expedition other than those of 1499–1500 commanded by Pinzon and Lepe, both of whom are known to have manifested an intention of returning to make a more detailed examination of the land they had discovered. This intention on the part of Pinzon is proved by the land grant, doubtless solicited by him, of 1501; and on the part of Lepe by the Real Cedula dated November 15, 1500, to go "a la parte donde la outra vez fui." * No record has been preserved showing that either of these projected voyages was carried out, but in view of the uncertainties regarding many of the known voyages of the time, this negative proof is of doubtful value. A strong presumption that Pinzon actually did visit the domain ceded to him, and found it disappointing, is furnished by the document † dated March 24, 1505, commissioning him to colonize the island of San Juan (Porto Rico). It hardly seems probable that this commission would have been given by the king, or accepted by Pinzon, if in the mean time his grant of far more magnificent proportions on the mainland had not been examined and proved to be practically worthless from the point of view of the time, since it did not furnish the pearls and gold that, after his first voyage on the South American coast, more fortunate discoverers had commenced to find on the coast west of Pariá.

In the present case, however, we are not limited to hypothetical voyages, however plausible these may be. The explorations in question may very well have been an incident of the voyage in 1508 of Solis and Pinzon, who on their return are said to have followed the coast southward from Pariá to Cape St. Augustine, and so might very well have stopped to explore the freshwater sea discovered by Pinzon eight years before. The study by Denucé of the Egerton map has elucidated this much-discussed voyage, principally by proving that the writings of the earlier chroniclers, beginning with Peter Martyr, who furnished "copy" for his successors, must be subjected to quite as careful a sifting as the

---

* Medina, Juan Dias de Solis, i. p. xciv.

† *Ibid.*, ii. p. 3.

cautious historian gives to the work of the average modern reporter.* Thus, Denucé has demonstrated that the name involving a date (Golfo de Natividad) given by Pinzon and Solis does not refer, as stated by Peter Martyr, to the presence of Columbus in the Gulf of Pariá on Christmas Day of 1498, but to their own presence in the Gulf of Honduras on December 25, 1508. To have left there after that date and to have reached the mouth of the Amazon on the 20th of the following January would involve a voyage made under extremely favourable circumstances and without intermediate stops. Only an experienced navigator in those waters can say whether or not such a voyage is possible at that season of the year. As, apart from the hypothesis of favouring winds and currents, it involves that of departure from the Golfo de Natividad immediately after its discovery, with the set purpose of reaching the mouth of the Amazon as quickly as possible, this voyage cannot be interpolated in the 1508 expedition of Solis and Pinzon with any marked degree of plausibility. Another argument of some weight against this interpolation is the great length of time (from the end of March to October) which it leaves for the voyage to Spain from the turning-point of the Amazonian exploration.

Thus, with the evidence at present at hand, the year of this exploration of the mouth of the Amazon must be considered as doubtful, with a presumption that it was not made on either of the recorded voyages of Pinzon or Lepe, but rather on some unknown voyage by one or the other of these navigators at some time between the years 1500 and 1508.

On a preceding page the topographical representation of the coast-line proper in the neighbourhood of the mouth of the Amazon and the gulf of Maranhão on the Egerton and La Cosa maps is stated to be substantially the same. This is a matter of considerable importance, since the comparative study of the two maps in this section throws light on the Spanish use of the name "Marañon" prior to the descent of the Amazon by Orellana, as exemplified by the Diego Ribeiro map of 1529. In the annexed reproductions on approximately the same scale, it is evident that, on all three, the deep narrowly triangular indentation to the right and the broader sack-like one to the left are intended to represent the same topographical features. The first is the Gulf of Maranhão, and is so named on the Ribeiro map; the second is the mouth of the Amazon, designated on the La Cosa map by the Pinzonian name of "G. de Stma" (Golfo de Santa Maria de la Mar Dulce).

It is evident that in the compilation of his map Ribeiro took as his prototype for this part of the coast some unknown map in which the topographical representation corresponded better with that of La Cosa than with that of Morales,

---

* A most striking example of the manner in which Peter Martyr jumbled the events that he recorded is his placing in the gulf of Pariá those that took place in the Gulf of Honduras (see Denucé's paper, p. 73). Curiously enough, he gives elsewhere the proof of the careless character of his work in regard to this very point. Thus we read on page 75 of Gaffarel's translation of this Second Decade (edition of 1516), "Vincent Yanez revint du cap Saint Augustin après avoir racolté de l'or qui lui fut donné par les habitants de la fertile province de *Ciamba*." From what precedes, this name Ciamba, which does not appear on any map, belongs to the Pariá region, yet on page 62 of the same translation of the Third Decade, in speaking of Columbus, after leaving the island Guanassa, we read: "A un peu plus de diz mille il decouvre une vaste terre que les indigènes nomment la Quiriquetana, mais qu'il appella la *Ciamba*." It would be interesting to verify what changes were made from the 1511 to the 1516 edition of the Second Decade, but unfortunately no copy of the earlier edition is at hand.

but with a notable simplification of the indentation representing Pinzon's Mar Dulce, which is reduced to a simple inward curve of the coast with the insignificant, almost depreciative, denomination of "Furna." The characteristic names "Costa de Paricura" and "Visto de lexos" must have come from the same original prototype as the similar names on the Egerton map, but in position they were moved from their proper place on the north of the Amazonian estuary to a corresponding place with reference to the gulf of Maranhão. This simplification of the drawing and movement of names seem to have been made by some predecessor of Ribeiro, as they occur in the Turin map of 1523 (?), while, on the other

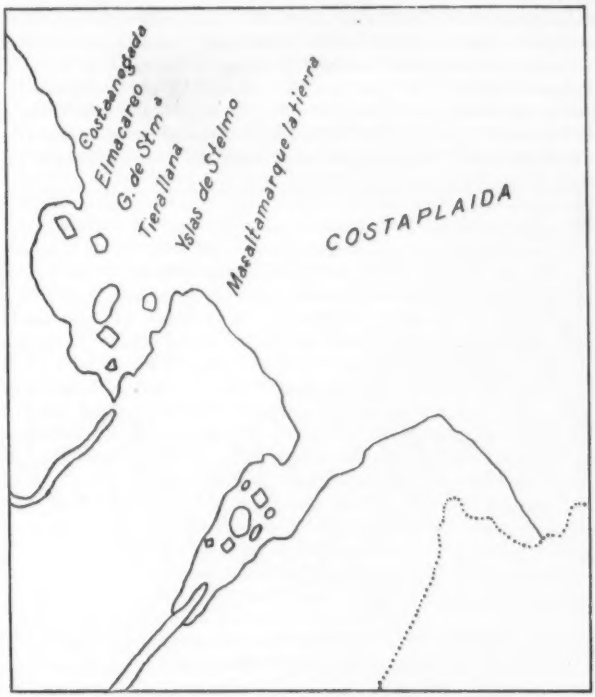
EGERTON MAP.

hand, the Freducci and Maiollo maps bear evidence of being based on the same prototype as the Egerton.

On the other hand, the nomenclature of the Ribeiro map clearly indicates a source of information almost completely independent of the two documents here considered. Between Cape St. Roque and the Gulf of Pariá forty-two names are given, of which only two ("C. Negro and b. hermosa") may presumably have been taken from the La Cosa map, while three others ("capo blanco," "visto de lexos," and "Costa de Paricura") occur with certainty on the presumed Morales map.* These last names, however, are removed from the position they

* In the matter of nomenclature the Ribeiro map shows a stronger relationship with the Turin map of 1523 (?) than with either of the other two, since it has ten names in common, all of which occur in the St. Roque-Amazon section. This probably indicates that the Italian compiler of the Turin map used as his prototype for this (and

occupy on all the earlier maps in which one or both of them appear (Egerton, Freducci, Maiollo, and Turin), and are placed near the northern entrance of the indentation which by name and position clearly represents the Gulf of Maranhão Thus Pinzon's "Mar Dulce," which figures so distinctly on the La Cosa and Egerton maps, becomes practically obliterated in official Spanish cartography



JUAN DE LA COSA.

until the voyage of Orellana forced its restoration, but with its present name of "Amazonas."

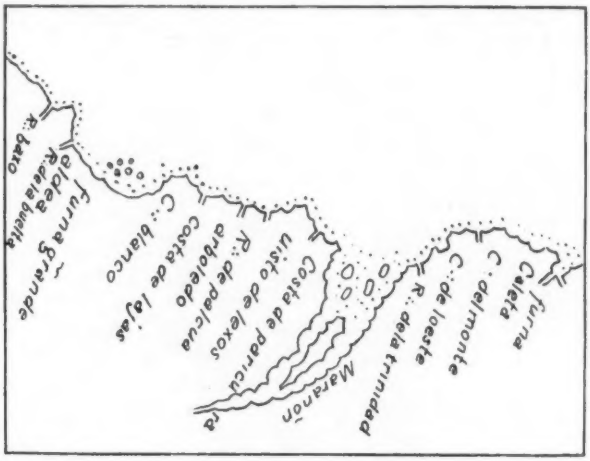
The nomenclature of the Ribeiro map, which is substantially identical with that of the earlier map of 1527, thus affords positive evidence that towards the end of the third decade after the discovery of the South American mainland, the official Spanish cartographers had maps made by explorers in regard to whom no written record has been preserved, and which were considered by them as

---

presumably other sections) a copy of a now unknown Spanish map, the original of which, preserved in the Casa de la Contratacion of Seville, was considered by official cartographers, like Ribeiro, as a better prototype than the earlier La Cosa and Morales maps. It certainly registered names given by navigators, of whom no record has been preserved except in the Italian maps of Freducci, Maiollo and Turin, and in the later Spanish ones of 1527 and 1529.

more trustworthy than the earlier ones of La Cosa and Morales. Apparently this newly acquired information had seemed to indicate that the freshwater sea of Pinzon should be identified with the Gulf of Maranhão, which might well receive that denomination, at least during the time when the rivers discharging into it are in flood, and which also presents the other characteristic phenomenon noted by the first discoverers, that of the *pororoca* or bore.*

The later maps above mentioned show that the newly acquired information, instead of confirming and extending the topographical details given in the earlier ones, seemed, to the minds of the cartographers of the time, to refute them in important particulars. This can best be explained by the hypothesis of partial explorations proceeding from the extremities of the section, but failing to meet and overlap in its central portion, *although presumed by the mapmakers to do so.* The nomenclature of Ribeiro's map to the north of the "Furna Grande," to which



DIEGO RIBEIRO.

he reduced the enormous Amazonian gulf of his predecessors, has a river of the Return (R. de la Vuelta), which may plausibly be taken to indicate that an expedition coming from Pariá had here turned back. Whatever its course had been, it had followed the coast sufficiently closely to note the presence of Indian villages designated with the name of Aldea, a word that appears at three points to the northward of the Furna Grande, but nowhere to the southward of that point.

In the southern section as well, the Ribeiro and Turin maps have a series of

* Apparently it was, in Europe, considered incredible that there could be more than one break in the coast presenting the phenomena of fresh water in the open sea, and of the *pororoca*. Few of the strange things reported from the new world made a greater impression than these on the mind of Peter Martyr, who seems to have identified the two phenomena with the name "Marañon" in such a way that he was in doubt if this name did not really belong to the Orinoco, to which the freshening and the agitation of the Gulf of Pariá, first reported by Columbus, had come to be attributed (see Gaffarel's translation, Decade 2, p. 84; Decade 3, pp. 84, 104).

names not taken from the earlier known maps, which extend from cape St. Roque to the only great indentation represented, named "Marañon" on the first map, but nameless on the other. The inference is obvious that there may have been northern and southern expeditions, all of which turned back without having recognized the mouth of the Amazon, and thus cast a doubt on its existence. It is to be noted that it is exactly in this section between "Marañon" and "R. de la Vuelta," that both Ribeiro and the compiler of the Turin map copied most largely the coast names of the supposed Morales map, while they suppressed all the interior ones and took the greatest liberties with the topographical drawing.

Shortly after the making of the Ribeiro map the Portuguese expedition of Martim Affonso de Souza, in 1532, divided at Pernambuco (Itamaracá island, where a trading station had long been established); one division, under the command of the chief, proceeding southward to the La Plata estuary, and the other, commanded by Diogo Leite, northward to the southern mouth of the Amazon, to which the name of Rio São João was given. One of the results of this expedition was an absolutely new map of the eastern coast of South America included between the mouths of its two greatest rivers, in which the topographical representation was greatly improved and copious additions were made to the nomenclature. The earliest copy that has come down to us (if it is not the original itself) of the map illustrating the results of the expedition is that of Gaspar Vieigas, dated 1534, which is authenticated by the occurrence of the name of Diogo Leite on the coast of Maranhão and that of Martim de Souza on the coast of Rio Grande do Sul. Contrary to what is generally assumed to have been the jealous policy of the Portuguese Government of that time, the new representation of the coast was quickly divulged.* Oviedo's description of the lost *padrão real* of Alonzo de Chaves shows that this representation was known and in part (the north-east coast of Brazil) utilized by the Spaniards in 1536, and this is confirmed by the immediately following maps of the official cartographers Alonzo de Santa Cruz (1539), Sebastian Cabot (1544), and Diego Gutierrez (1550); the French cartographers Desliens (1541) and Desceliers (1550) clearly made free use of it, while the maps recently found in Italy (Ricardienne, Ricasoli-Firandolfi) and France (National Library, Paris) may be presumed to be approximately contemporaneous Portuguese copies, or variants, of it.

The Spanish cartographers above cited evidently found difficulty in substituting the section (from Cape St. Roque northward), which they accepted from the new Portuguese prototype, for the corresponding section of their own maps. The new representation of the Gulf of Maranhão and that of the coast to the eastward was accepted without material alteration, but that of the coast west of Maranhão had to be considerably modified both in configuration and nomenclature to combine with the other units employed in their compilation. The discovery of the Amazon by Orellana seems to have raised a question as to whether its mouth should be identified with the gulf of Maranhão—the only prominent indentation of the coast on the official maps (1527, 1529, 1536 (?)) that seemed

* The ear-mark by which it can most readily be recognized in all maps for which, directly or indirectly, it served as a prototype, is the peculiar and relatively accurate configuration of the Gulf of Maranhão and its tributary rivers. The critical names above mentioned were omitted on most of the variants of the map, and have been misread on that of Gaspar Vieigas, so that their significance has not been perceived. Thus Harrisse ('Discovery of North America,' pp. 600, 601) read "Diego Leste" instead of "Diogo Leite," and "mtia° de rourra ?" instead of "Martim de Souza." The true reading is clearly given on the Diogo Homem map of 1558, which is evidently based on the same prototype as that of Vieigas.

competent to receive the great stream—or be made independent. The latter hypothesis was accepted by Sebastian Cabot (1544) and Diego Gutierrez (1550), but afterwards the latter (in the map printed in Amsterdam in 1562) combined the two hypotheses by boldly prolonging, with the name Rio de Marañon, one of the two small streams that he had previously represented as entering the gulf, across the continent to Lake Titicaca, thus duplicating the Amazonas of Orellana. In one form or another this false river figured on all maps of South America for about a century and a half, until in 1707 La Condamine made known in Europe that wonderfully accurate piece of early cartographical work, the Amazonian map of the Jesuit priest Samuel Fritz. Some cartographers traced the false river as wholly independent; others made it an intra-continental bifurcation of the Amazon, and still others, an upper tributary of which the lower course corresponds approximately to the Madeira. In all this cartographical juggling the point of interest for the present discussion is that in the majority of cases the name "Marañon" accompanies the southern or false stream and only occasionally is it used, as an alternative title, for the true Amazon or Rio Orellana, and still more rarely as an exclusive title for this stream. Fritz and La Condamine, who gave the death-blow to this geographical nightmare, adopted the usage of the double denomination, and thus the name Marañon became definitely fixed on the great river, first as a synonym of Amazonas, and eventually as the definite title of its Andean section. The generally received opinion that from the earliest times the official Spanish cartographers applied it to the mouth of the Amazon can no longer be sustained now that it is known that they had before them maps of the type of the Egerton. What happened, on the contrary, was that they rejected as doubtful or false a representation of the coast that eventually proved to be more accurate than the one they accepted, and thus the Gulf of Maranhão, which they figured in its correct position and with its proper name, came to be taken for the Mar Dulce of the first discoverer of the mouth of the Amazon. This geographical confusion assumed afterwards great diplomatic importance, as on it were based some of the strongest arguments presented by the French in support of their territorial claims to the south of the Oyapoc, which recently became legally established as the definite boundary between Brazil and French Guiana. To students of American cartography this was a fortunate circumstance, since it made accessible to them the magnificent collection of reproductions of maps with which the Brazilian representative, Baron de Rio Branco, illustrated his defence of the rights of Brazil.

GEOGRAPHY AT THE BRITISH ASSOCIATION, PORTSMOUTH MEETING, 1911.

By Prof. A. J. HERBERTSON.

THE meeting of the Geographical Section at Portsmouth was not marked by any of those dramatic narratives of exploration and adventure, which have on some occasions attracted great crowds; and the papers were almost all technical in character, and read to comparatively small audiences. Even the presidential address, already published in last month's *Journal*, was delivered mainly to professional geographers.

Two out of the four working days were given to joint meetings with the Geological and Botanical Sections. Outside the intersectional discussions the papers were chiefly cartographical, with the exception of Captain Rawling's

admirable paper on "Exploration in Dutch New Guinea," which has appeared in this *Journal*.

On the opening day Prof. Herbertson showed a new map of the Thermal Regions and of the Globe. He discussed various methods of making such a map, and insisted that ordinary isothermal maps must be modified to indicate real as well as ideal temperatures with a view to dividing the world into natural climatic regions. The result is a map useful primarily to geographers as the sea-level isothermal maps are useful primarily for physicists. This was followed by a paper by Mr. A. R. Hinks, of Cambridge, on "Colour in the Representation of Hill Features," in which he advocated the addition of small bands of colour to the contour-lines instead of colouring the whole space between two contours. Captain E. O. Henrici next read two papers "On Mean Sea-level" and "On the Height of Ruwenzori," which will be published separately in the *Journal*.

Aëronautical Maps.

The discussion on these papers is published in full in this month's *Journal*.

The Solent River.

At the joint meeting with the Geological Section Mr. Clement Reid, F.R.S., read a paper on the "Former Connection of the Isle of Wight with the Mainland." The following is a summary of the paper:—

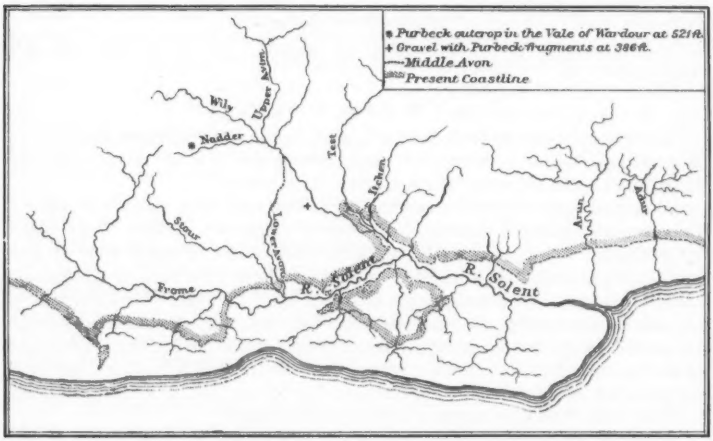
A hundred years ago and more valleys of this sort were commonly referred to some convulsion of nature, which formed a wide rift, cutting off an island by a channel of uniform width, and the width of the channel showed how much the island had been shifted laterally. There is no need to discuss any such hypothesis. Somewhat later, channels like the Solent were referred to the eroding action of the sea and tide. But this hypothesis breaks down as soon as we make a careful examination of the shores of the Solent, of its tides, and of their scour. The sea is neither cutting nor widening the Solent, and except in the parts where the waves of the open sea can reach, there is a great tendency to silt up and form wide tracts of salt-marsh or shingle.

The third hypothesis, which is commonly accepted at the present day, is that the Solent is a submerged river-valley which has been cut into laterally by the sea and thus isolated. But opinions differ as to the direction in which this river flowed. Did it come from the east or from the west? Mr. Reid maintained that the ancient river Solent flowed from the west, and was one of the largest rivers in England, comparable in drainage area, and also in its relation to the geological structure, to the Thames.

If we stand on one of the hills near Portsmouth or on the central downs of the Isle of Wight, we see at once that we are dealing with a very wide river-valley. On either side of the Solent or Spithead sheets and terraces of sub-angular river-gravel slope up and up to a height of at least 400 feet above the sea, though in the centre of the valley they pass actually beneath the present sea-level. These gravels have a very peculiar composition, and by tracing the stones toward their source we can arrive at some very surprising conclusions as to the direction of flow of the ancient Solent. Leaving out of account the ice-carried erratics, which in this part of England seem never to have been stranded more than 50 feet above the sea, we find that the gravels at higher levels are full of greensand-chert and contain fragments of Palæozoic rocks belonging originally to the west country. The old idea that the

cherts came from the central axis of the weald would not account for the other stones, which certainly could not have come from that district. But gradually some fifteen or twenty years' work at the geological maps of Hampshire, Sussex, and Dorset enabled the geologists of the Survey to trace the stones to their sources, and slowly unfolded one of the most beautiful examples of river-development and river-destruction.

The general result of this work is shown on the map, copied from one published by Mr. Reid in the 'Ringwood Memoir' of the Geological Survey. It was not till he had worked westward into Dorset and Wiltshire that he realized how important a river the ancient Solent had been. The map shows approximately its course, though minor details, when more closely studied, may need modification. On the map this river-system is reconstructed for a definite date. When first Earth-movements formed the Tertiary basins of Hampshire and London, each of these basins—which are very similar and both closed by



THE OLD COURSE OF THE SOLENT.

harder rocks on the west—was occupied by an eastward-flowing river, the Thames and the Solent. The valley of the Thames seems merely to have deepened, retaining all along approximately its original course. The valley of the Solent, on the other hand, ran for some distance parallel to the sea coast and at no great distance from it, and the sea finally broke through the narrow ridge of chalk which once ran continuously from the Needles to the Dorset coast, thus diverting the Frome and all the western rivers from their course to the Solent, and isolating the Isle of Wight. This flank attack had still other effects. The lower Avon, instead of having a fall of many miles before reaching the sea somewhere near Portsmouth, was shortened, and reached the sea by a steep direct course. Consequently, as the river flowed over loose Tertiary strata, it lowered its bed so rapidly as to cut back its valley and capture the whole drainage of Salisbury plain, which previously had followed its natural course south-eastward and flowed into Southampton water. To some these ideas may seem highly speculative; but Mr. Reid discovered clear evidence of this diversion. The high-level river gravels of the Vale of Wardour, containing very peculiar fossiliferous Purbeck cherts derived from an outcrop

at 521 feet, went straight across the Avon valley, and were found on its east side at the height of 380 feet, thus showing that when the rivers flowed at a level some 300 feet higher than now they were tributaries of Southampton Water. Thus the great river Solent had its headwaters cut off and was divided into several separate river-basins, each with its own outlet, which happened in late Pliocene times. These flank attacks are still going on further west, and if they continue much longer the breach at Lulworth cove may widen and deepen in the same way, so that with slight submergence the so-called Isle of Purbeck may become a true island exactly comparable in its geological structure and mode of origin with the Isle of Wight.

Though at this early date the Isle of Wight was cut off from the mainland, it was probably at first only cut off by a small stream and marshes, and was sometimes an island, sometimes part of the mainland, as the sea-level varied. The final isolation took place at quite a recent period, for if Mr. Reid and Prof. Ridgeway are right, the Isle of Wight is the Ictis and Vectis of classical writers to which the ancients traded for tin. The island of Ictis is described as being cut off at high tide, but connected at low tide by a narrow stone causeway. This causeway, Mr. Reid believes, was the ridge of Bembridge limestone which swept across what is now the Solent from Yarmouth to Hurst Castle, and was intact about 2000 years ago. It has now been destroyed by the attacks of the sea, and was apparently impassable even during the Roman occupation, for the roads seem to have led to a ferry further east and out of the run of the sea.

Thus geology and history join hands, and geology helps us to understand the origin of one of the most important harbours of the world. The Solent, Spithead, and Southampton Water are parts of an ancient submerged valley-system. The magnificent waterways thus formed are now slowly silting up; but that the process is not more rapid is due to the happy accident which diverted so much of the drainage of the ancient Solent to the open sea. Had it been otherwise, instead of the present fine harbours round Portsmouth we should have had a series of alluvial flats and sandbanks, such as now block the lower reaches of the Thames.

Constructive Waterfalls.

Prof. J. W. Gregory, F.R.S., then showed a number of views of the waterfalls in the Karst region formed by deposition. He said that waterfalls are among the most effective agents in deepening river-valleys, and thus lowering the land. Their influence is usually regarded as solely destructive; but they may, under some conditions, be constructive and act as agents of deposition instead of denudation. This action is well illustrated by some waterfalls in Dalmatia, Bosnia, and Herzegovina.

The Kerka falls in Dalmatia, 10 miles from Sebenico, illustrate a simple type of constructive waterfall. They are due to a barrier of calcareous tufa, which the Kerka river has built up across its valley. The barrier is 130 feet high; the river is subdivided into many channels, and each falls in a succession of cascades over the tufa terraces. Above the barrier is a plain of alluvium, and a short distance upstream the river flows from two lakes, one of which is 8½ miles long. The lakes have been formed by the tufa dam, and as this barrier is being raised in height with its advance downstream, the lakes are being increased in size owing to the action of the waterfall.

The Topolie falls on the upper Kerda river afford a clear illustration of the construction of a tufa dam by a waterfall. The fall is about 70 feet in height,

over a tufa barrier which is being deposited by the waterfall. The barrier is advancing downstream, and the old gorge of the Kerka river, or, as it is there called, the Kerkic river, is accordingly being filled with alluvium. When the falls have advanced another 500 yards, the river will leap from a hanging valley on to the floor of the Knin basin.

The famous falls at Jajce, the ancient capital of Bosnia, are due to the leap of the Pliva river, from a hanging valley over a tufa sheet, 80 feet thick, into the Urbas river. Some Neolithic remains show that about 60 feet of the tufa has been deposited at Jajce during and since Neolithic times. The Pliva river has cut a notch through the old sheet of tufa which it had previously deposited, owing to an increase in the gradient of the river caused by other tufa bars erected further up its valley.

These three waterfalls show that the ordinary waterfall action may be reversed; waterfalls may advance instead of retreat, may fill up valleys instead of excavating them, may form alluvial plains instead of destroying them, and may make lake-basins instead of draining them. Waterfalls may also form hanging valleys.

Tidal Movements in the Skagerrak and Movements of Herrings.

One of the most valuable and interesting communications was that by Prof. O. Pettersson on "Tidal Movements in the Deep Water of the Skagerrak and their Influence upon the Herring Fishery," illustrated by many slides, some of them cinematographic.

The most prominent feature in the hydrographic state of the eastern side of the North sea, and its tributaries, the Baltic, the Kattegat, the Skagerrak, and the Scandinavian fiords, is the stratification of the waters in layers of different origin discernible by differences in their temperature and salinity. The bounding surface between two adjacent water layers can, as a rule, be located with considerable accuracy, and by means of a registering apparatus changes in the level of the deep water (as distinguished from the surface water) can be ascertained. A study of these changes conveys the idea of a train of big submarine or boundary waves. This wave movement seems to have its origin in the deep water, as the surface water enters or is expelled from a fiord, whenever there is a subsidence or upheaval of the deep water. There are small boundary waves of two to three days' period, which are evidently seiches of the deep water inside the fiord, since they do not correspond to analogous movements of the deep water of the Skagerrak outside a fiord, and there are great boundary waves of thirteen to fourteen days' period, which are not confined to the fiord, but are in most cases felt on the other side of the Skagerrak. The great boundary waves seem to correspond in their period with the changes in the position relatively to the Earth of the Sun and the Moon; (*a*) the regular train of such waves begins with the autumnal equinox and ends in the following April, the biggest waves thus occurring when the Earth is in perihelion; (*b*) the phases of the Moon, but still more, its declination and distance from the Earth, seem to have influence upon the occurrence of the big waves.

It seems obvious that the motions of the deep water are of a tidal nature, and it seems possible that they belong to the special classes of such phenomena called tidal seiches, *i.e.* movements of the waters of a limited basin caused by the passages of the oceanic tidal waves over its threshold. To investigate this theory, tank experiments were conducted, from which it would appear that the original tidal wave, whether it be forced or free, is modified by its impact upon every submarine ridge it encounters, and gives birth to tidal

phenomena of various kinds which can, however, always be recognized by their periodicity.

The occurrence of big boundary waves seems to exercise an influence upon the arrival of the herring shoals on the coasts of Sweden in autumn and winter. It is well known that the fish-life of the ocean has its greatest intensity where the movement of the waters is most intense. Investigations show that since 1753 the herring fishing has been most prolific in years of maximum declination of the Moon and least prolific in years of minimum declination. A high declination causes a more energetic movement of the waters of the innermost parts of the North sea and its inlets. In summer the herring shoals are spread over the whole northern plateau of the North sea, and in winter are found concentrated in the eastern and southern parts. The chief agent is the Sun's declination (and the Earth's perihelion), which causes the yearly period. The influence of the Moon, on the other hand, upon the movement of the deep water causes the periods of abundant and scarce fishing every eighteenth or nineteenth year.

The British Flora and the Glacial Period.

Mr. Clement Reid was also the opener of an animated discussion which took place at a joint meeting of geographers, geologists, and botanists on "The Relation of the Present Plant Population of the British Isles to the Glacial Period." Mr. Reid's remarks were as follows :—

The distribution of our British plants has long been a puzzle to the botanist, and no explanation was forthcoming till the cause was searched for in bygone changes of climate, and changes in the distribution of land and sea. A century ago it was generally supposed that species had originated mainly in the districts in which they were then found. But even under this hypothesis the anomalies of discontinuous areas seemed to require explanation, for the same species was not likely to originate at several different points.

With the growth of the idea of gradual evolution it was realized that faunas and floras had a past history, even if the included species had remained unchanged. Botanists recognized that there were many points that required explanation. For instance, it was noticed at an early date that each of our mountain-tops possessed a small outlying fragment of the arctic flora. How came it that the same species occupied so many different mountains? This seemed a perfectly fair subject of inquiry, even to naturalists who hated the very idea of evolution when applied to species and genera.

More than sixty years ago a great impetus was given to this study by the discovery that Europe had passed through a most remarkable series of climatic changes, and that, too, during the lifetime of the existing species of animals and plants. There had not been a mere cooling of the climate; the temperature in these latitudes had sunk far below its present level, and then had again risen.

Edward Forbes, in 1846, seized this clue, and explained through it, as relics of the Glacial period, the arctic plants stranded on our mountain-tops; they were plants left behind when the climate became too warm for them any longer to survive on the plains. The subsequent discovery of fossil remains of these plants scattered over the plains, and often associated with relics of arctic animals now extinct in Britain, seemed a brilliant proof of Forbes' view, which has been generally adopted.

In some curious way, however, botanists and zoologists both seem to have overlooked the difficulty that, granting Forbes' hypothesis to be sufficient to account for our alpine flora, it rendered more difficult instead of easier the

explanation of our southern flora, which occurs in a similar way, stranded in some of the warmest lowlying parts of Britain.

We meet to-day to discuss this question, in the hope that botanists, zoologists, and geologists may realize each other's difficulties, and may be able in combination to give a clear teaching on this important problem of geographical distribution.

The discussion I have been asked to open is limited to the relation of the present Plant Population of the British Isles to the Glacial Period. Our problem is a special one; it is not the same as that which confronts the botanist on the Continent of Europe or in America; and it is not the problem of the origin of the flora of an oceanic island. Also, the wider question of the origin of the species composing the British flora is outside the discussion, for it would lead us into too many untrodden bypaths, and could not satisfactorily be gone into in the present imperfect state of our knowledge.

Perhaps it will be well to explain at once why the inquiry is thus limited to comparatively recent periods, and how it is that we need not explore the unknown earlier periods and deal with larger questions.

Our first inquiry in this case must be: Has there been any continuous occupation of Britain by a temperate flora and fauna from pre-Glacial times to the present day? Or, to put it in other words: Are any of our plants survivors that managed to live through the cold of the Glacial period in some warm nook in Britain? They evidently found a refuge somewhere; for we know that the same temperate species that live in Britain now were here in pre-Glacial times. But was this refuge in Britain?

Here geology comes to our aid, and I think that all geologists who have made a special study of the climatic conditions will agree with me. Any survival of our flowering plants, except in the case of a few arctic and alpine species, was quite impossible.

It may come as a shock to some of my colleagues when I say that for this particular discussion we have a perfectly definite starting-point. We have merely to account for the incoming of our existing flora, after an earlier assemblage had been swept away almost as completely and effectually as the celebrated volcanic eruption wiped out the plants of Krakatoa.

In order to make clear the existence of this limitation, and for the convenience of the discussion, I have prepared certain maps, which are now shown. I propose now to say a few words as to the bygone climatic and orographic changes indicated on those maps, and on their being on the existing flora of Britain. I must say at once, however, that you must not take these maps as absolutely exact statements as to the climatic and geographic conditions at the different stages involved in our inquiry. But they give the result of many years' work at this subject, and, I think, may be accepted as embodying the main factors which dominate the question we have to discuss

We know that during the greatest intensity of the cold all Scotland, Ireland, and the greater part of England were buried under ice and snow—except, possibly, for some high peaks on which a few arctic species survived. Ice filled the North sea and covered the lowlands of England down to the mouth of the Thames. Without crossing the Thames it almost reached London. Its southern limit stretched to South Wales, where tongues of ice reached the Bristol channel in big glaciers like those of the Antarctic Regions or Greenland. In South Wales a few hills may have escaped, though surrounded by ice.

The glaciation in Ireland was even more extreme, for apparently no part of Ireland escaped. Even the warmest parts of the south-west are striated and

covered by morainic material, the ice extending well out into the Atlantic. The icebergs were so big, or the ice-foot so thick, that, breaking away from the Irish coast, the masses were able to float across to the Scilly Isles before they melted; for they carried with them numerous striated stones of well-known rocks, now found stranded on the highest parts of the Isles of Scilly. Thus it is evident that in those days Scilly, our most southerly and warmest point, was surrounded by a bitterly cold ocean, and it was submerged to such an extent that it could be overridden by pack-ice. Could any temperate plant survive such treatment? I particularly want you to realize the climate that Scilly enjoyed in those days, for it is now one of the warmest spots in our islands, and its temperate flora has come back, though the islands are surrounded by fairly deep sea.

It seems evident, therefore, that a temperate flora could not have survived the cold in Ireland or in the Scilly Isles. But there is still the non-glaciated area south of the Severn and Thames to consider, and botanists may tell us that the temperate flora survived in some warm nooks in Devon or the Isle of Wight. Here, however, we can point to evidence that the botanist himself must accept as conclusive. In the south of Devon one of the warmest of the sheltered valleys is that through which the Teign flows to Newton Abbot. But in the alluvial deposits of this valley, and only a few feet above the sea-level, Prof. Oswald Heer and Prof. Nathorst discovered leaves of the dwarf Arctic birch and some Arctic mosses.

Time will not allow us to go into all the evidence; so I will only point to one or two other areas which prove the extreme rigour of the climate in the South of England. Close to Salisbury are found in profusion remains of various Arctic mammals—reindeer, musk-ox, Arctic fox, lemming, and several others. Unfortunately, plants do not seem to have been searched for, and the sections were obscured when I visited the pit; however, the flora associated with this assemblage of mammals can only have been the flora of the Arctic regions.

To come nearer home, around Portsmouth itself we have abundant evidence of this icy sea, for in the peninsula of Selsey especially we find numerous large erratic blocks floated by ice. Some of them have been identified as coming from the Isle of Wight, others from Bognor and Cornwall, and a number came from the Channel islands. Thus even the north coast of France had its shores fringed with ice.

I have attempted to show on a map what the Channel was like when Spithead was thus blocked with ice-floes. Is it possible to believe that the plants of the south of England, many of which can barely hold their own during a severe winter nowadays, could have survived these Arctic conditions?

If the southern plants were completely swept away by the cold, the question arises: How did they come back again, especially to islands like Ireland and the Isles of Scilly, and how did they obtain their very singular present geographical distribution? We are told that the matter is simple enough, for Britain has often been connected with the Continent, and the plants spread slowly overland. However, before we adopt the view that for animals and plants to spread to islands it is needful to have land connection, you should remember Krakatoa, and the rapidity with which the exterminated flora has come back. Also I must point out that there are peculiarities in the distribution of the different elements that go to make up the existing British flora that no land-connection will explain. Look at the recent distribution. One of the most striking peculiarities is the Pyrenean element in our flora. It is practically confined to two areas, the one in Cornwall and the other in the west of

Ireland. Geologists nowadays will not agree to the reconstruction of a lost Atlantic to account for this peculiar distribution.

Undoubtedly since the Glacial period our islands have seen several oscillations of level. There has also been widening and narrowing of straits and channels. England has been connected with France near Dover, and also across the North sea with Holland and Denmark. But 20 or 25 metres seem to have been the approximate extent of the rise in the south of England. I have searched in vain for evidence of a greater movement. A shallowing of the sea by 25 metres is not nearly sufficiently to connect Ireland with England or Scotland, or the Isles of Scilly with England. Still less would it suffice to connect the west of Ireland or Cornwall with the Pyrenees, where the peculiar plants find their home. A rise of land to this amount would not even bring Scilly and the Land's End appreciably nearer together.

This limitation of the extent to which we can bridge over the gaps between our islands is, however, a point on which there is much difference of opinion, and I will not insist on the conclusiveness of the evidence as to the extent of the oscillations.

From the botanist's point of view, there are, however, other archipelagos besides those surrounded by water. No doubt if we can postulate sufficient orographic changes plants would spread slowly from land to land during the few thousand years that have elapsed since the cold died away. But—and this "but" is all-important—that would only do so if the soils were suitable. An isolated tract of limestone surrounded by clay or by sand is as much an island, as far as many of our most peculiar plants are concerned, as if it were surrounded by water. We have many such islands—or oases is perhaps a more suitable term for them—and no possible ups and downs of the land will connect them. Many of them, like the central limestone district of Ireland, or the Peak District in Derbyshire, or the West Yorkshire Carboniferous limestone, must have been isolated from far-distant geological periods, from times before the present flora of Britain had any existence. We have a still more difficult problem than this. Britain is divided into numerous river-basins, for most of which any connection with other basins in post-Glacial times is unthinkable. Yet each basin yields numerous aquatic plants and animals of the same species as those found in other basins cut off by high hills. Isolated lakes have their aquatic flora; and even artificial ponds, such as the dew-ponds of our high chalk downs, have a fauna and flora closely proportionate in the number of species with the time that has elapsed since the pond was made, or since it last dried up. If no actual connection between river-basins or isolated ponds is needed for the spread of aquatic plants, why need we postulate a land-connection for the land-plants, or a bridge of limestone to aid the migration of the limestone plants from crag to distant crag? Aquatic plants and limestone plants must obviously in most cases have taken leaps of many miles to arrive at their present stations. Our plants have far greater power of crossing deserts and seas than most botanists are willing to allow.

Let us examine the present distribution of one of the most interesting groups of British plants. The Atlantic or Lusitanian plants form an assemblage belonging mainly to the Pyrenees, and found also in the south-west of England, and again in south-west Ireland. But they do not occur in the intermediate districts. If we look more closely into the composition of this Atlantic flora, as it is represented in Britain, we find that only plants with small seeds have been able to cross to Cornwall and Ireland, those with large seeds being left behind on the Continent. There is only one tree among them, and that is the

Arbutus, one of the few trees with minute seeds now living in Europe. A further examination confronts us with the puzzle that, whilst various Pyrenean species are found also in Cornwall and Kerry, the species occurring in Cornwall and Ireland are not the same. The *Arbutus* is a case in point; it is wild in Ireland, but in no part of England. *Erica ciliaris* and *E. vagans* are English, and not Irish; *E. mediterranea* is Irish, and not English.

The local distribution of these plants is equally strange. A few, like *Pinguicula lusitanica*, have spread throughout the west country, wherever the conditions are suitable. Most occur, however, in quite different fashion; they are abundant over certain limited areas, to which they are strictly confined, but they are absent from other adjoining areas, though equally suited. I have mapped and examined a good many of these areas, and the plants seem in most places to be spreading vigorously from certain definite centres, to which chance has transported a seed. Thus, *Erica ciliaris* is confined to two areas, one in Cornwall, the other in Dorset. *E. vagans* occurs abundantly in the Lizard and again on quite different soil in North Cornwall, so that the serpentine soil has nothing to do with its present distribution.

Chance introductions of seeds during thousands of years explain the existing peculiarities of geographical distribution in a way that no changes of sea or land or climate will do. Our alpine flora consists largely of survivors from a colder period; the rest of our flora, on the other hand, is constantly being added to by chance introductions from the nearest continental shore. This is why the Atlantic element and the eastern element, though not consisting to any great extent of maritime plants, are confined mainly in Britain to areas within a few miles of the coast. Seeds are evidently brought from the Continent and scattered broadcast over certain coastal districts, and they grow and spread where soil and climate are suitable. But the post-Glacial period has been so short that the process is still incomplete, and the slow spreading inland has only as yet extended a few miles. We can still fix the point or points of introduction.

The most striking elements in the British flora, except the arctic and alpine species, have a marked coastal distribution. The plants found correspond with those of the land opposite (in which they are often inland, as well as coastal). Thus the Cornish plants and those of south-west Ireland contain a large Pyrenean element; Norfolk plants correspond with those of the opposite shore of the North sea; even two or three American plants are found on the coasts facing America.

All the evidence seems, therefore, to point to a steady change and increase in our flora, due to occasional introductions. These introductions are, I think, now mainly due to birds driven by exceptional gales. But herds of migrating bison, deer, and horse have played their part, especially when the Straits of Dover were much narrower or non-existent. Packs of wolves which hunted the large game, foxes, cats, and especially raptorial birds which waited for and struck down the tired migrants, must also have assisted. Fences and the destruction of wild animals have probably rendered the process far slower than formerly; but it still goes on, as any one can see who notes the constant occurrence of seedling oaks miles from the nearest tree.

If I am right, therefore, there is no such thing as a native plant in Britain. Our flora has been swept away like that of Krakatoa; but we have arrived at a much later stage of the re-peopling in our islands. It seems to me far more interesting to watch this process of introduction, change, and spreading than to enter into speculations as to what species shall be listed as "natives,"

"denizens," or "colonists." No such differences exist; it is all a question of degree.

Britain for several thousand years has been receiving colonists from all sources, and the process still goes on. The oldest element in our flora, the alpine, occurs on nearly all our mountains; for it once occupied the intervening areas, and it does not greatly depend on conditions of soil. The limestone, aquatic, and Lusitanian flora, on the other hand, are more recent introductions; they can never have occupied continuous areas, and their present distribution is full of singular anomalies. These three elements of our flora are steadily growing in importance, whilst the alpine element is stationary, or tends to die out.

A letter was read from Dr. Alfred Russel Wallace, in which he pointed out the significance of the snow which formed a protective mantle over Southern England in the Ice age.

There was a long discussion, in which several distinguished foreign botanists took part.

Dr. Scharff of Dublin urged that our large mammals, some recently extinct, were pre-Glacial. Dr. Stapf of Kew considered that we had to deal with the remains of a much more extensive flora, and that limestone preserves certain dry types. Prof. Schroeter outlined the views of two opposing Swiss schools. One, the Glacial school, traced a succession of post-Glacial floras—(1) tundra, with an arctic-alpine flora, the arctic element immigrating from certain refuges after the Glacial period; (2) steppe, with continental conditions; (3) forest, with less continental climate. The other, the Oceanic school, believed in an oceanic climate during the Ice age, permitting the survival of many plants. He also said that on the Continent the effects of winds in dispersing seeds was underrated, for even fairly heavy seeds could be carried by it. An instance of this power of the wind was the finding of one gram of salt on the St. Gotthard pass, which must have come from a sea at least 400 km. off. Dr. Wright urged that Great Britain and Ireland had both been relatively stable since Glacial times, and that the sea-level was practically the same now as then.

Letters were then read from Dr. J. E. Marr of Cambridge, who cited the heaths of Brekland and of North Germany as remains of an old steppe flora, and from Prof. Kendall of Leeds, who recalled the fact that he had himself applied Mr. Clement Reid's method to the flora of the Isle of Man, and affirmed his belief that it had been isolated since the Ice age, and that the Strait of Dover was pre-Glacial.

Prof. Drude next expressed the view that Mr. Reid's theory was not necessary, for heavily glaciated Greenland has over 400 species of plants. The influence of inter-Glacial periods must be somewhat like our own, and probably retreats for species of some delicacy were found in some of the Saxon Swiss valleys. Dr. Lewis of Liverpool showed from his peat-bog studies that there was considerable evidence for changes of level. In Scandinavia, Orkney, and the Outer Hebrides there are buried forests with a marsh flora, and he considered "fossil" botanical evidence pointed to considerable changes of climate. He also agreed that the Lusitanian flora was a relic flora. Dr. Ostenfeld said that no temperate species had survived in the British Isles, but only tundra species. Only small-seeded species of Lusitanian plants were found in Ireland, but larger-seeded species were found in England, some of which might have come by land, but not through South Ireland. Dr. Arber believed that the Alpine plants came from Central and Northern Asia and not from the Arctic.

THE SEA OF ARAL.*

By E. MARKOV.

ALTHOUGH the study of Russian lakes has reached an important development during the last ten years, we have not till now had a single great scientific monograph on the subject of our native country's limnology. In the literature of Western Europe there are only two works of similar character: the monograph on Lake Leman, by Prof. Forel, in three volumes, and a detailed study of Lake Balaton, which also includes the ethnography; and in the latter case it must be taken into consideration that the study is the result of the combined work of many specialists. Mr. L. Berg's book appears as a first attempt to give us a detailed description of one of the largest interior water areas in Russia from the physical and geographical point of view, not so much in the form of a compilation, but principally as a study, based on his own observations and explorations. The book is therefore to be welcomed; and it is bound to occupy a foremost place among Russian limnological works. The importance of the book is the greater, thanks to the careful elaboration of the material, the clearness of its arrangement, and the author's extensive acquaintance with the literature of the subject.

The book is divided into ten chapters, the last of which presents a summary of the results of the foregoing chapters, which considerably aids the reader to understand the author's views on the questions touched on in the book. At the end there are indexes of authors, subjects, geographical and foreign names. The book is printed in clear type, and is illustrated with seventy-eight drawings in the text and two maps, both well executed.

In the first chapter the author gives us a sketch of exploration in connection with the history of the mapping of the Aral sea. The first mention of the sea is found in an Arabian writer, Ibn-Ruste, at the beginning of the tenth century. It seems that the sea was unknown to the Greeks and Romans. The first map of Aral was done by Istakhri in the middle of the tenth century. In the year 1339 Kazwini speaks about the turning of one part of the river Amu-Daria into a new channel leading to the Caspian sea. We have very interesting ideas from the large map and atlas of Siberia by Remesov (1701). The expedition of Bekovich to Khiva (1715–17) enlarged our knowledge of this region. The first detailed map of Aral was done by Muravin (1740). Among the persons who visited the sea of Aral in the nineteenth century were Count Berg, Nikifforof, Butenef, Butakof, who worked out a map of the sea (1848–9), Severtzof, Barbott de Marny, Alenitzyn, Tillo, Darandt, Schultz, Abich, K. Schmidt, and others.

The second chapter deals with the topography and hydrography of the sea. On the Aral coasts there are at present three points of reference, by the aid of which the level can be determined, viz. (1) that laid down by Tillo (1874) at the spot known as Kara-Tamak; (2) that of L. Berg (1900) on the rock of Tokpak-Auli; (3) the zero of the limnograph, placed near the station "Sea of Aral" in 1905 and connected with the water-level of the Baltic. The absolute altitude of the Aral water-level in July, 1901, was fixed by Tillo's bench-mark as 49·8 metres, and on the basis of the railway levelling as 50·28 metres. The author adopts the mean of these, or exactly 50·0 metres. The area of Aral by Tillo's and

* L. Berg, 'The Sea of Aral. Attempt at a Physical and Geographical Monograph.' With 2 Maps, 6 Lists, and 78 Plates. (Reports of the Turkestan section of the Russian Imperial Geographical Society, vol. 5. Scientific results of the Aral Expedition. St. Petersburg. 1908.)

Shokalsky's calculations, on the basis of the 100-verst maps of the Russian General Staff, is equal to 67,820 sq. kilom. (26,186 sq. miles), but Berg's measurement on the map appended to the present work, on a scale of 25 versts to the inch, gives a smaller area, viz. 64,490 sq. kilom. (24,900 sq. miles), including the islands, or 63,270 sq. kilom. (24,430 sq. miles) without. Thus the Aral surpasses all the lakes of the globe in size, except the Caspian sea and Lake Superior in North America.* Its extreme length is 428 kilom.; the extreme depth 68 metres; the average depth 16 metres; and the volume about 1000 cub. kilom. In proportion to its area the lake has a very slight depth; the volume of the water is comparatively small. While the area surpasses that of the Lake of Geneva 110 times, the volume is only 11 times greater. In the central part the depth varies from 20 to 28 metres; the depths exceeding 30 metres extend in a narrow trough for a distance of 100 miles along the western coast.

The area of the whole basin, including those of the rivers Zariavshan and Chu and of Lake Issyk-kul, amounts to 1,835,980 sq. kilom., but the surface of the basin directly discharging its waters into the Aral does not exceed 600,000 sq. kilom. (including the area of the sea itself). The rivers which fall into the sea, Amu-Daria and Syr-Daria, supply on an average 2500 cub. metres per second.

Chapter III. deals with the morphology of the coasts. Berg's observations show that the western coast belongs to the type of flat coasts, the northern to the indented, while the southern is of a mixed type. On the eastern side we find a peculiar form of coast indented by bays, which may be called the Aral type. It differs from the others in the abundance of shallow bays running far into the land, which is completely low-lying and waste. In the author's opinion this special form of coast morphology has its origin in the encroachment of the sea (by the elevation of the water-level) on a land eroded by the winds. The solid matter annually brought down by the affluents, to the amount of 34·26 million cub. metres, would fill the whole basin in 29,100 years. The accumulation of the ooze on the bottom raises the level 0·5 mm. annually, and would thus reach a height of 4 metres in 8000 years. With water standing at such a level the sea of Aral must submerge the Aibugir depression and unite itself with the Sary-Kamysh basin, which would then have its outlet through the Uzboi to the Caspian. In this way the Aral would be transformed into a fresh-water lake with regular outlet.

Chapter IV. is concerned with the climatology of the Aral sea. The mean annual temperature of the air in the Kizyl-Jar (the mouth of the Syr-Daria) is 7·6° C. (1901–3, 1905), that of July, 25·3°, and of February, 9·5°; the nebulosity is on an average at 7 a.m. 44 per cent., at 1 p.m. 42 per cent., and at 4 p.m. 35 per cent. Fogs are rare. The yearly rainfall averages 108 millimetres (4·25 inches); the average wind velocity at 7 a.m. is 5·2 metres, and at 1 p.m. 6·3 metres. In summer north-west and west winds predominate; during the rest of the year the prevalent winds are from the north-east. According to the observations at Kasalinsk in 1885–99, the average annual evaporation amounts to 1020 millimetres, the average annual precipitation to 122 millimetres; the ratio of the evaporation to the rainfall is therefore 8·4 : 1. In damp years the proportion is less (1896, 4·8 : 1), in dry years greater (1893, 13·9 : 1).

Chapter IV. deals with hydrology. The peculiar composition of the Aral water, nearly resembling that of the Caspian—its richness in sulphates and

* According to some estimates, the area of the Victoria Nyanza also exceeds that of the Aral.—[Ed.]

poverty in chlorides—permits the author to count both the basins (judged by the chemical composition) as lakes, in contrast, for example, with the Black sea, composed of sea-water of somewhat reduced salinity. The surface salinity averages 1·03 per cent.; specific gravity, 1·0086. The slight saltness of water along the western coast is due to the current, which issues from the mouth of Amu and flows north. The specific gravity at a depth of 61 metres is 1·0097. The highest temperature of the surface water in the centre of the sea is 27·8°, and the daily range is between 0·8° and 1·2° C. In summer the temperature of the water, both in the day and at night, is lower than the temperature of the air. The Aral sea tempers the climate on the coasts; thus the daily range of the air temperature in the centre is 1·54°; on the coast station of Kyzyl-Jar is 6·0°; and at Kasalinsk (135 kilometres from the coast) is 9·8°. Only the north-eastern part of the sea is subject to the annual freezing; the duration of the ice-covering reaches 160 days in some years (1897–8); the thickness of the ice does not exceed 0·7 metre.

The author notices that in general, as regards the vertical distribution of the temperature, the Aral sea is very like the fresh-water type of lakes—the temperatures of the depths are extremely low. In July and August, 1900, the following were recorded: at a depth of 10 metres, 10·7°; 10 metres, 5·5°; 40 metres, 1·6°; 60 metres, 1·0°. The fall of the temperature is very unequal at different depths. The so-called "discontinuity layer" * is in some places very striking. On August 11, 1901, the author observed the following vertical distribution of temperature: †

Depth	...	0 metre	16 metres	16·5 metres	17 metres
Temperature	...	22·6° C.	17·8° C.	16·9° C.	4·8° C.

This gives a difference in temperature of 12° C. in an interval of ½ metre, a fall of 0·24° in 1 centimetre. In Berg's opinion it is the most rapid fall of water temperature in a vertical direction which has ever been observed on the globe. The observations of I. D. Kusnetzov, who visited Lake Baikal in the years 1902, 1907, and 1908, show us, however, that the steepness of the gradient in this lake is not less, and possibly even greater, than in the Aral sea.

This observer obtained the following record of vertical temperatures of the Bay of Chivirkuisk:—

Depth	...	6 metres	6·25 metres	6·5 metres	7 metres (the bottom)
Temperature	...	19·80° C.	18·9° C.	9·8° C.	8·1° C.

which gives a fall of 9·1° C. in 25 centimetres, or 0·36° in 1 centimetre. It appears that the palm of priority for the rate of fall in temperature with depth must be given not to the Aral sea, but to Lake Baikal. A very slight rise of temperature with the depth is (0·2 to 0·3°) sometimes observed. The transparency of the Aral water is very great down to 24 metres; the colour in the centre of the sea is dark blue (No. 3 of Forel's scale).

Chapter VI. examines the question of the change of level, and the currents, of the Aral sea. The annual range of fluctuation of the level is not great (in 1903, 0·34 metre). The maximum falls in the second half of the summer or in September, the minimum in November, to judge by the few observations made. The diurnal range is very considerable (1·36 metres on December 6, 1904). The period of the seiches reaches a length not hitherto observed, *i.e.* precisely 22¾

* "Sprungschicht."

† The depth of the sea being 30 metres.

hours; the shortest period is 8·6 hours, and the maximum height of the seiches 1 metre. From the mouth of the Oxus a current is observed to flow along the western coast to the north, from the mouth of Syr-Daria one along the eastern coast to the south. Thus a circular motion of the water, corresponding to that of the hands of a watch, is observable. In the Aral sea, as in other lakes, periods of high water alternate with periods of low level.

The information collected by the author gives us some idea of the character of the change of level, beginning with the year 1780. On the curve to be found on page 389 we can see that in 1785 the level stood very high; in the twentieth year of the nineteenth century a low level was observed; in 1835–50 a high one; in 1860 a small maximum; in 1880 a minimum; while in 1885 a rise set in, which continues still. The rise of level from 1880 to 1908 has amounted almost to 3 metres. The fluctuations of the level coincide approximately with the changes in other lakes of Turkestan and Siberia. The study of the historical geography of Turkestan has led the author to the conclusion that within the historical era the climate of Turkestan and of Eurasia generally had not sensibly changed. Therefore the opinion long held by Russian geographers, and even now by some scientists of Western Europe, as to the progressive drying of Central Asia must be totally rejected.

In Chapter VII. we have the description of the deposits which cover the bottom of the sea. As can be seen from the lithological map of Aral annexed to the work, the sandy deposits extend approximately to the depth of 10 metres, the remaining space being covered with grey ooze; only in the region of the greatest depth, near the western coast, do we find black ooze which gives off sulphuretted hydrogen. In Berg's opinion the reason of the giving off H_2S is the same as has been shown by Lebedintzef to hold good with regard to the Caspian—the decomposition of the albuminous substances under the co-operation of bacteria, whose presence in the Aral sea has been established by M. Bogomoletz. The question of other possible reasons for the described phenomenon remains in the mean time open.

Chapter VIII. treats of the Flora and Fauna. In the Aral only 137 species of plants are met with. Very characteristic is the presence of the typical representatives of polithifones and diatoms: *Chætoceras, Coscinodiscus, Actinocyclus.* The fauna is very poor, comprising only seven specimens of molluscs, 18 of fish, and one amphipod. This indicates that the Aral was once a fresh-water lake at the time when it communicated with the Caspian, and that the cause of the extinction of forms was the fact that many had not the power to adapt themselves to the new conditions. The fauna of Aral is composed of endemic forms; of forms common to the Caspian, which proves the former connection between the two seas; specimens which are met in seas and oceans; and finally, cosmopolites.

In the ninth chapter the author discusses the geological structure of the Aral coasts. We find there deposits of Upper Jurassic and Cretaceous, Tertiary (Nummulitic Limestones, Lower Oligocene, Aquitanian stage, Lower and Middle Sarmatian) and Quarternary age. The upper limit of the Aralo-Caspian deposits is approximately equal in the Aral and the Caspian seas (+54 metres, or 4 metres below the Aral level), which gives the author reason to suppose that in the Aralo-Caspian period the two seas were united. The lowering of the Caspian level caused the transformation of Aral into a fresh-water lake with outlet; later, in prehistoric times, the Aral began to dry up, and became a salt-water basin. Historical records prove that, from the middle of the thirteenth century till the middle of the sixteenth, part of the water of the Amu-Daria flowed along the Uzboi into the Caspian sea. The cause of this may be probably found in the increased rainfall.

It seems that the origin of Aral is tectonic, the basin having probably been formed by a fault about the end of the Miocene.

As has already been mentioned, the copious scientific materials collected by Berg have been subjected to very careful study. In his deductions the author shows in general great caution, though all his conclusions are not equally well grounded. For example, in the second chapter, page 116, comparing the height of Tillo's bench-mark relatively to the level of the sea in 1874 with the height in 1901, the author supposes that the yearly fluctuation of the level cannot affect the results, because the levelling in both cases was executed at the end of July. This supposition is not well grounded, since the maximum rise during the year does not always fall within the same month; *e.g.* in 1901 the highest level was in July; in 1902, in August; in 1903, in September.

On page 96 we have a map showing the distribution of transparency of the Aral water, which is, in the author's opinion, the first attempt of a cartographical representation of this element. Ninety-six measurements of the transparency were made, one to each 672 sq. kilom. But seeing that the variation of this phenomenon depends on the distribution of temperature, specific gravity, wind, currents, etc., it must be admitted that the transparency of the water cannot be represented exactly on the map, on account of the large size of the basin and the small number of observations.

On page 412 the author puts forward an hypothesis that, owing to the obstacles to vertical circulation in the western, deepest, part of the sea, the cause of the emission of H_2S is the decomposition of the albuminous substances under the agency of bacteria. The supposition that vertical circulation is difficult is somewhat at variance with the author's opinion about the influence of the winds on this phenomenon. The variation of temperature at the bottom of the sea, in the deepest parts, confirms this opinion; thus, at a depth of 60 metres a temperature of 1·0° was observed in 1900, but in 1902 one of 4·1°; the difference amounting to 2·1°.

In the ninth chapter the author, as a proof of the sinking of the lowlands which has taken place in the northern part of the Caspian in the Post-Pliocene epoch, adduces the finding of river deposits in the town of Saratov at the depth of 52·2 metres, or 26·3 metres below the level of the Caspian. The last figure quoted appears to be inexact, because the absolute altitude of the surface at the bore-holes at Saratov is 78 metres. Therefore the deposits which were found at the depth of 52 metres lie 52 metres *above* the level of the Caspian. Besides this, if we examine the profile of the artesian wells at Saratov, we already find the black clay of Lower Cretaceous age at the depth of 42·7 metres (61 metres above the level of the Caspian sea), and there can be no question of a sinking in this case. We arrive at the same conclusion by studying the bore-holes in the Government Monopoly Spirit Warehouse in Kamyshin, where we find the white and black silicious strata, similar to the upper horizons of the Cretaceous marls, at an altitude of 20 metres above the level of the Caspian sea.

These observations cannot, however, lessen the importance of Berg's work, which is a valuable addition to Russian limnological literature. We hope, therefore, that the publication of his results will give an impetus to further studies of the fresh and salt lakes, which are dispersed in such large numbers over the vast area of the Russian Empire.

REVIEWS.

EUROPE.

'The Kent Coast' ('The County Coast Series'). By Arthur D. Lewis. (London: Unwin. 1911. *Illustrations.* 6*s. net.*) The coast of Kent, along the banks of the Thames to the Sussex borderline, is very varied, offering such contrasts as the Shakespeare Cliff at Dover and the Romney Marshes. There are many points of interest connected with this "Great Gate of England," many spots of historical and literary note: the Cinque Ports of Dover, Deal, and Walmer, the Broadstairs of Dickens, and Folkestone and Sandgate of H. G. Wells. The book is pleasantly written, and is not too prolix for the tourist to use as a guide-book, with the additional charm of just sufficient history, folk-lore, and reference. There are numerous excellent photographs.

'The South Wales Coast, from Chepstow to Aberystwyth' ('The County Coast Series'). By Ernest Rhys. (London: Unwin. 1911. *Illustrations.* 6*s. net.*) This sketch of coast-line is so long, the history and romance connected with it so full and varied, that this book—not on guide-book lines—dealing with modern and ancient phases is easily confusing to the reader. The writer knows his subject well, and loves the ground he covers. The list of Ordnance Survey maps given is complete, but one would find it convenient if at least a sketch of the coast, with names, were given *in* the book. That on the inside of the cover is very indifferent and easily overlooked. There are many drawings and photographs.

'The Alpine Guide. The Central Alps.' Part II. By the late John Ball. New edition, revised . . . under the general editorship of George Brook. (London: Longmans. 1911. *Maps.* 7*s.* 6*d. net.*) This re-constructed and revised edition of the latter part of the second volume of Ball's Alpine Guides is the work of many contributors, and "uniformity of style and complete accuracy" are disclaimed by the general editor. But the result is of very even merit, the various routes being fully and sufficiently described. Geographical, geological, and botanical terms and references to works other than guide-books—there is a list of these at the commencement of the work—are recorded as instances occur. The district covered is divided into five sections, and these subdivided into routes. The maps are taken from that published by Ravenstein (Frankfort-on-Main) which is specially recommended for the Lepontine Alps.

'Cook's Handbook to Norway and Denmark, with Iceland and Spitsbergen.' (London: T. Cook & Son. 1911. *Maps and Plans.* 1*s.* 6*d. net.*) In addition to the information given in the previous edition of this guide there are several new features. The chapter on "Norwegian Sanatoria"—a quite recent development in Scandinavia generally—emphasizes the practice of individualization at these establishments in advance of that at the older health resorts. The sports are fully dealt with, there being a chapter on winter sports in the North. The general descriptions of the countries are pleasantly written, especially that of Denmark and the Danes. "Every stone in Denmark . . . can be traced home to Norway." The information is well divided under various headings, and the maps are particularly clear and well printed.

'Handbook to Norway.' (Ward, Lock & Co.'s Guides.) (London: Ward, Lock & Co. 1911. *Maps, Plans, and Illustrations.* 2*s.* 6*d. net.*) A very full and complete guide. There is an interesting historical sketch and a literary note, also a chapter on the "Wooden Stave Churches of Norway" in which

the theory is advanced that the peculiar ship-like appearance of these buildings is accounted for by the shipyard traditions being firmly rooted in the people descended from the old sea-kings, the dragon-head gables corresponding to the dragon-head beaks of the ancient Viking ships. The present lack of efficient mountain guides is noted in the chapter on sport, the native view being that the line of verdure is the limit of accessibility.

ASIA.

Mount Fuji and its Flora.

'The Vegetation of Mount Fuji.' With a Complete List of Plants found on the Mountain, and a Botanical Map showing their distribution. By B. Hayata, Lecturer on Botany, Imp. Univ. of Tokyo. Size 8½ × 6. *Map, Plates and Illustrations.* Tokyo: Z. P. Maruya & Co. 1911. 6s. *net.*

This beautifully illustrated book dedicated by the author to his mother is the outcome of a very thorough botanical survey of the famous Japanese volcano. Dr. Hayata has spent many summer vocations studying the flora of the mountain, and the preparation of the material for his book has evidently been a labour of love.

The book quite naturally opens with a general account of the physiography of the region, according to which the author endeavours to account for the observed distribution of vegetation types. Besides the several distinct altitudinal zones of vegetation common to all high mountains in warm or moderately warm climates, there are in the tree levels two main types of vegetation characteristic of the northern and southern sides of the mountain.

On the southern side of the tree region, broad-leaved deciduous trees predominate, whilst on the northern side evergreen needle-leaved conifers are characteristic. The primary factor concerned in this distribution, Dr. Hayada shows to be neither soil, temperature, rainfall, wind nor sunshine, but the relative humidity of the air according to season. During the winter season, *i.e.* in the non-growing season, the southern flank is much drier than the northern, the reverse being the case in the growing summer season. This at once explains the distribution, for deciduous trees need moist air in summer, and having no leaves for transpiration in winter are not in danger of being injured by a dry atmosphere in winter, whereas the conifers having a comparatively small leaf-area can better withstand a dry atmosphere in the growing, summer, season than deciduous trees. "In short," says the author, "deciduous trees do not require moist air in the winter, but do in the spring and summer."

This statement that deciduous trees do not require a moist atmosphere in winter is no doubt correct in a primary sense—in so far as the mere existence of trees in a fair state of development is concerned; but we doubt if it holds good in a secondary sense—with respect to the difference between the most flourishing trees and those in a poorer state of development.

The deciduous trees of Central Europe, for example, whether in England on the western side or in Russia on the eastern, all experience a summer so far moist that abundant rains are liable to fall, thus assuring the essential condition of a sufficiently moist summer atmosphere, and it is apparently of little consequence to the trees that in England the winter is excessively damp and in Russia relatively dry. Even in Russia a permanent winter snow cover must tend to keep the relative humidity higher than it otherwise would be.

But in view of the magnificent specimens of oak, beech and elm, which adorn

the southern shires of England (especially perhaps in Berkshire and Hampshire), such as are not, so far as we know, rivalled in eastern Europe, it seems probable that English trees are in some way favoured by a very damp winter atmosphere, affording possibly additional protection to bark and bud-scales against transpiration processes.

From a psychological point of view there is something extremely interesting in the contemplation of a Japanese book written from cover to cover entirely in the English language, as though that were the language of a nationality which is not only one of the most strongly individual, but also one of the most truly "foreign" on the face of the earth. It is no reflection upon the learned author of the book under review to observe that the literary style though perfectly good is eminently a foreign English. Transplant a language into a distant land and it at once begins to undergo a slow process of variation in response to new surroundings, as is well seen in the case of the English of the United States.

L. C. W. B.

Punjab Hydrology.

'Punjab Rivers and Works.' By F. S. Bellasis, M.INST.C.E. Pioneer Press, Allahabad. 1911. *Charts and Diagrams.*

This memoir, written by the late Superintending Engineer, Punjab Irrigation, will appeal chiefly to irrigation engineers. The Punjab rivers are briefly described in Chapter I. Attention is drawn to their shifting nature, and two methods of altering their courses are described. "Erosion," or the silting up of one bank while the other is being eroded; and "avulsion," or the cutting out of a new channel. A tortuous course, with a wide channel occupied chiefly by sandbanks and minor creeks, is stated to be characteristic of these rivers. Referring to the rise and fall of the water-level, it is stated to be nearly stationary from about November 1 to March 1. In March the rivers begin to rise, and attain their greatest height in July and August, and fall rapidly in September and October. The highest floods are said to be over in the Indus by about August 10 or 12. The discharge of the Indus in winter is given as 22,000 cubic feet per second, and it is stated that in a high flood it may be fifty times as great. The velocity in winter is given as 3 or 4 feet per second, and in high floods as 6 to 8, and the surface gradient as less than 1 foot per mile.

The erosion of the banks is dealt with at some length, and the author makes the following statement: "It is now well understood that the tendency of a stream to scour or transport silt increases with the velocity, but decreases with the depth." This is, perhaps, rather a sweeping statement, and might be less open to criticism if its scope were somewhat narrowed; for example, it is not easy to see how the depth of a stream can affect the transport of material by rolling along the bottom, except in so far as it influences velocity. Referring to the persistent shifting of the Indus in one direction, Mr. Bellasis says, "In a reach some 70 miles in length, near the south of the Punjab, and not far from where the river enters Sind, the Indus, in its changes, attacks the right bank more than the left, and thus the net result at the end of a series of years is generally a westward movement of the main stream and of the river-bed. In the thirty-five years, from 1875 to 1910, the westward movement has amounted to 2 or 3 miles." The possible causes of this westward movement are discussed, and the author is of opinion that the Earth's rotation is not sufficient to explain it. He does not suggest an alternative explanation, except the presence of forest on the eastern side, but thinks it may be "merely one of a series of great

and slow changes, which can no more be explained than the local and rapid changes."

Chapter II. is on Inundation Canals, III. on Flood Embankments, IV. on River Training Works, and V. on Outlines of Annual Work and Procedure. These subjects are dealt with from the irrigation engineer's point of view, and much useful information is given. The print is clear and easily read, and contains very few printer's errors. On page 18, line 21, however, the word "deposits" is printed evidently in mistake for "depends." A large number of figures are given at the end of the book, but the references are not always easy to follow; as, for example, on page 31, where the line of flood embankment in Fig. 22 is referred to as mdnqbztrsvw. Fig. 2 is given to illustrate the effect on the water-level of a change in the course of a river; but there is no indication as to direction of flow, and this rather spoils the illustration of an interesting point.

The size of the book—13 by 8 inches—and its thin paper cover, make it a little inconvenient to handle, and the absence of an index detracts greatly from its value. It contains, however, much that is interesting, especially to the irrigation engineer, and many valuable practical hints. One feels, however, on reading the book that a somewhat more systematic arrangement of the subject matter, and especially a good index, would add much to its value.

J. S. O.

'The Economic Transition in India.' By Sir Theodore Morison. (London: Murray. 1911. Pp. 251. 5*s*.) This volume contains "the substance of a course" of what must have been highly interesting lectures. The two first chapters are those which will chiefly arrest the attention of geographers. A comparison is traced between archaic and modern methods of transport in the first, with parallels from our own country, and in the second the Indian village community is studied. The remainder has little direct concern with geography, but it forms an introduction to economic problems in a land where commercial geography may be studied in almost every stage of development.

'The English factories in India, 1634–1636.' By W. Foster. (Oxford: Clarendon Press. Pp. xl., 355. *Frontispiece*. 12*s*. 6*d*.) This forms the fifth volume of a calendar of documents in the Indian Office, British Museum and Public Record Office, published under the patronage of the Secretary of State for India. The chief geographical interest of these lies in the insight they afford into methods of communication by land and sea with or within India at this period, including the stories of various commercial expeditions.

AFRICA.

African Rubber.

'The African Rubber Industry and Funtumia elastica.' By Cuthbert Christy, M.B., etc. London: John Bale, Sons & Danielsson. 1911. 12*s*. 6*d*. *net*.

The African rubber industry is a thing of less than fifty years' growth, and already there is serious anxiety as to its permanence, owing to the reckless destruction by the natives of the sources of supply. Mr. Christy has done well, therefore, to put this aspect of the case in the forefront of his book, the first to deal adequately with the subject. While giving some account of all the plants from which African rubber is produced, the book is mainly devoted to a full description of *Funtumia elastica*, to the study of which tree the author has devoted several years. He has covered thoroughly the whole ground, not only with regard to structure, distribution, climate and soils, the chemical and physical

characters of the latex, but also with respect to methods of cultivation. The value of the work is enhanced by a map, many diagrams, and a large number of photographs. A brief closing chapter deals with Funtumia in other countries than Africa. It is to be hoped that Mr. Christy's book will lead to better systems of cultivation and of tapping, and to the preservation through plantation of the most valuable of African forest products. F. R. C.

The Lokele Tribe.

'Yakusa. The Very Heart of Africa.' By H. Sutton Smith. London and Edinburgh: Marshall Bros., Ltd. *N.d.* 6*s. net.*

Yakusa is a station of the Baptist Missionary Society, situated on the Congo immediately west of Stanley Falls. For a distance of 75 miles either bank of the river is here inhabited by the Lokele, and it is of these people and the work of the Baptist missionaries among them that Mr. Sutton Smith writes. We have a clear-cut picture of a virile race which has maintained its tribal organization and lived at peace with the white men. The courage and faith with which the missionaries carry on their task is not dwelt upon, but comes out incidentally. These men are doing a good work for civilization in general, and it is encouraging to note that they are labouring on rational lines—the development of the Lokele in self-dependence, and not in dependence upon a mission station. This implies much sympathy with and understanding of the Lokele point of view. (Mr. Smith is frankly perplexed on the question of clothing. In their native state the Lokele go almost nude; the missionaries would have their converts clothed—for the sake of the weaker brethren, in this instance the white folk.) A good deal of space is devoted to the customs and culture of the tribe; there is also a brief chapter on the Lokele language. The author has a good word for the Arabs of the Stanley Falls district, and draws an engaging picture of the government station (really a sizeable town) of Stanleyville. F. R. C.

POLAR REGIONS.

Spitsbergen.

'Quer durch Spitsbergen.' Von Wilhelm Filchner und Dr. Heinrich Seelheim. Berlin: Mittler und Sohn. 1911. 3 *mks.*

It was decided in March, 1910, that the German Antarctic Expedition should start in the spring of 1911. In the mean time the leader Herr W. Filchner, taking as his motto "Optimist in execution, pessimist in preparation," and the geographer, Dr. H. Seelheim, decided to make a trial expedition into Polar regions with the view of using the experience gained thereby for the larger and later undertaking. The crossing of the largest of the Spitsbergen islands from Ice fjord to the eastern coast was chosen as offering favourable features for the purpose, and this book gives an account of the travellers' experiences in covering the route. The vicissitudes of travel are described, also the hindrances of drift-ice and the final stranding of their boat on the return journey from Tempel to Advent bay, with an enforced sojourn at the most northerly coal-mine in the world at the latter point.

There is a *résumé* of previous research in Spitsbergen, good photographs, and a sketch of the route. The scientific results of the expedition are not here recorded.

M. G. B.

Polar Research.

'Polar Exploration' (Home University Library). By W. S. Bruce. London: Williams & Norgate. 1911. Pp. vii., 256. *Maps.* 1*s.*

This little volume is worthy of the excellent purpose of the series. It comes not only as a relief from the average records of Arctic exploration, but as a necessary adjunct to them, for it studies the polar regions regionally, not in any way historically. The author, with his experience of both circumpolar areas, was obviously called upon to prepare such a work, and it is gratifying to find an indication that it is intended as the prelude to a larger one. The subjects successively dealt with are the general characteristics of the two regions, land and sea ice, plant and animal life, oceanography, meteorology and kindred subjects, and there is a concluding chapter on the aims and objects of modern polar exploration—in short, a useful general survey, for which there was need.

'Auf Eisbären und Moschusochsen.' By R. Kmunke. (Vienna: Frick. 1910. Pp. x., 122. *Maps and Illustrations.*) A simple record of Arctic hunting experiences. It is cast mostly in the form of a diary, and forms little more than a slight textual frame for a series of fine photogravures and half-tones.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Coast-Surveying.

'A New Method of Coast-Surveying.' By John Ball, PH.D., D.SC., M. INST. C.E. Ministry of Finance, Egypt. Survey Department. Paper No. 21. Cairo: Printed at the National Printing Department. 1911. *Price* 100 *Milliemes.*

The method of coast-surveying here described is one that Dr. Ball has found useful in Egypt, specially in mapping the Red sea coast-line. A theodolite, reading with micrometers, is placed upon some prominent point of land, of which the exact height above sea-level is known, and from which the coast is visible for as many miles as possible. Vertical depression angles are then carefully measured to the foot of the various cliffs, promontories and other points of land along the shore, the distances of which are then readily obtained, without computation, by referring to a specially constructed diagrammetric scale. The horizontal angle read on the theodolite when each point is sighted will, when the instrument is placed so that zero coincides with the true north point, furnish the azimuth or true bearing, so that the exact position of each point sighted can be readily placed on the map. There is nothing new in the principle of this method, and many others have worked on the same lines. Still, obtaining distances from depression angles in surveying is not such a general method as might perhaps be expected, one reason being the somewhat lengthy computation involved in obtaining the correction for refraction with the accuracy required to give reliable results, notwithstanding various auxiliary tables that have been computed to shorten the work. Dr. Ball is doubtless right in stating that in order to render the method of surveying by depression angles of real practical utility it is necessary to proceed, not by modifying the formula, which must always remain complex owing to the nature of the physical factors on which it depends, but by arranging the manner of its employment, so that the points may be plotted in the field without computation. It is here that Dr. Ball has rendered valuable assistance, for by means of a most ingenious diagrammatic scale which he has constructed, and fully describes in this book, he states that it has been found possible to plot the points of a survey of

several hundred miles of the Red sea coast at a speed many times greater than could have been attained by ordinary traversing, and with at least equal accuracy. A suitable diagram of this kind can be drawn out before commencing work by the surveyor from the instructions here given, upon the scale on which the survey is to be carried on, provided the correct coefficient of refraction has been previously ascertained from observation. Its construction would occupy some time, but when done, the distance of the points is obtained at once by the length of the line determined by the intersection of a line showing the altitude of the station with that showing the vertical angle.

Although not of general application, there are times when this method of coast-surveying could be carried on with advantage, as Dr. Ball has himself proved, and it appears to be most useful in filling in the coast-line of a country where the main triangulation has already been completed, and prominent points definitely fixed in altitude. It is of course essential that the height of the points to be occupied by the theodolite should be accurately determined beforehand, since a small error here would often produce a considerable error in the distance. The coefficient of refraction must also be very accurately known, which is not an easy matter unless a lengthy series of observations can be taken. A serious error in the distance may result from a trifling mistake in this coefficient if the points are at any great distance. Then again the angle must be very correctly measured with the theodolite, and to ensure accuracy, instead of putting the instrument in adjustment beforehand and reading the angle on one face of the vertical circle only, as Dr. Ball has done, to save time in taking the angles, many surveyors would have more confidence in the result if both "face right" and "face left" readings of the angles were taken, even if it occupied a little more time to do this. E. A. R.

METEOROLOGY.

'Weather Science: an Elementary Introduction to Meteorology.' By F. W. Henkel, B.A. London; T. Fisher Unwin. 1911. *Illustrations.* 6*s. net.*

This book is designed as an "Elementary Introduction to Meteorology." As such it is an exceedingly useful work, and we wish it all the success which it deserves. We cannot, however, justly attribute much originality to the author. The statements are in many cases only too obviously borrowed piecemeal from previous, and often somewhat out-of-date text-books of meteorology, without further thought or observation; and one misses those flashes of original genius with which an enthusiastic and thoughtful observer of the weather will invariably illumine his statements of the facts of observation and their legitimate inferences. The arrangement of matter, moreover, is not altogether happy and the literary style is clumsy, one or two sentences here and there being terribly involved. On p. 180 we find the following: "Mr. John Aitken, to whom is due the recognition of the importance of dust in Nature, and who, more fitly perhaps than Ruskin, may be considered the founder of 'Ethics of Dust,' showed that minute motes or particles are everywhere present, even in the purest and clearest air remote from towns." This sentence not only strikes one as illiterate, but it also reveals a lack of appreciation of the propriety of Ruskin's title of a most fascinating discourse to school-children on mineralogy, in which the most wonderful play of imagination is made to illumine a depth of scientific knowledge in a way not paralleled in the language.

To return to the subject-matter proper of the book, the only serious error we have come across is in the explanation given of the cause of the excessive rainfall in the hill districts of our own and other countries. On p. 100 Mr. Henkel

says: "The air, being forced to ascend, is cooled by contact with the hilltops, and thus we get the heavy rainfall of our western counties. . . ." Now, the main cause of the cooling in the case of such low elevations as the British mountains is not the contact of the air-currents with the elevated surface; it is recognized to be the well-known thermodynamic process of the cooling of air consequent upon expansion at high levels. "The air, being forced to ascend," is *ipso facto* cooled, with resulting precipitation of cloud and rain. On p. 109 we are glad to be told what most text-books omit, namely, that the neck of low pressure between two anticyclones is subject in summer to violent thunderstorms. To emphasize this fact we need only say that in England nearly all our worst summer thunderstorms develop in the stagnant and frequently appallingly gloomy atmosphere in the "col" of relatively low barometric pressure between two anticyclonic systems. The physical reason is that the lateral pressure which the anticyclonic masses exert on either side upon the air situated within the narrow col is very liable to force up moisture-laden currents of air in this neck, especially if intense local heating takes place, and we know that the first essential process in thunderstorm development is rapid condensation brought about by powerful ascending currents. The death-dealing electrical explosions which affected so many places in and around London on the afternoon and evening of May 31 of the present year were occasioned by such a distribution of atmospheric pressure after an intensely hot and sultry day.

L. C. W. B.

GENERAL.

The Scope of Geography.

'Modern Geography' (Home University Library). By Marion I. Newbigin. London: Williams & Norgate. 1911. Pp. 256. *Diagrams.* 1*s.*

This is a most judicious survey of the scope of geography, so far as it goes—judicious, that is, in as much as it does not claim too wide a scope. The writer has thought it best to "look, so far as possible, at those aspects of the subject which make the widest appeal." These, in the writer's judgment (if we follow the chapter headings), are surface relief, and the process of erosion, ice-work, climatology, plant and animal geography, the races of Europe (chosen as an obvious illustration of a wider subject), and the distribution of minerals and the localization of industries and of towns. This rules out the purer aspects of geography, such as the making and use of the map, and, in truth, perhaps room might have been found for the latter of these at least; but the writer, working under strict limitations of space, does not deserve to be criticized when the space has been so well allocated as in this instance. We here find geography set forth as possessing a definite outlook of its own, sharing material with various sciences, but not leaning upon any of them; it can hardly be denied, after the reading of this volume, that the subject is its own support.

The Maps of Primitive Peoples.

'Karty pervobytnyk Narodof' (Work of the Geographical Section of the Society of Students of Natural History, Anthropology, and Ethnography, St. Petersburg, vol. 119). B. F. Adler. St. Petersburg. 1910.

The author has here collected with great trouble and care specimens of maps drawn by primitive men in all parts of the world, in Asia, America, Africa, and Oceania, as well as some prehistoric maps. In another part of his work he discusses maps of semi-civilized and civilized peoples of antiquity, Assyrian, old Persian and Indian, Greek and Arabic, etc., and compares some of the above with modern

maps, showing the degree of accuracy attained. The geographical horizon of primitive peoples is very limited, and therefore their maps are all special maps of their immediate surroundings or their own country. Of these the orographical maps are of great interest, especially the relief maps of North American Indians and Eskimos. In the maps also of the Marshall islands there is an attempt to show relief. Ethnographical maps are known from South America and elsewhere. Maps of the heavens are uncommon, though many primitive peoples have a knowledge of the stars; they have been found, however, in Brazil and the Pelew and Marshall groups.

Mr. Adler distinguishes several types or stages of primitive cartography. The first and earliest are temporary maps drawn on the ground, snow, or sand. The second stage is that of maps on bark, found in the north of Siberia and North America. With the substitution of paper maps were much improved, but lost their local colouring and were more rarely in common use among natives. The stick maps of the Marshall and Caroline islands are unique, and constitute a group of themselves, and the last type are the petrographic maps of the Yenesei, South America and California. W. A. T.

THE MONTHLY RECORD.

EUROPE.

The Eruption of Etna.—An important eruption of Etna began early in the morning of September 10. Numerous tremors and a few strong shocks were felt in different parts of the mountain; and, almost simultaneously, clouds of smoke and dust rose, probably from the central crater. During the day, four new vents were formed on the northern flank of the volcano at a height of about 9200 feet, and twelve more on the following day. Two days later the number of new vents had risen to fifty-four. At first the only materials ejected were smoke, dust, sand, and lapilli. Early on September 11, however, two new vents were opened about 4000 feet below the others, from which clouds of smoke and dust were discharged, followed by a flow of lava from both vents. The stream of lava, about one-third of a mile wide, flowed down the steep slope between the old streams of 1646 and 1809, crossed the circum-Etnean railway, and approached to within a short distance of the river Alcantara, which forms the northern boundary of the mountain.

The "Montagne" of Limousin.—Prof. Demangeon contributes to the *Annales de Géographie* (July 15, 1911) an admirable study of the geographical conditions which have given a special character to the human life of the higher region of Limousin, a tract so markedly separated from the surrounding areas that it has long been recognized in popular parlance as a distinct entity under the designation "La Montagne." An ancient crystalline *massif*, of an altitude nowhere below 2560 feet and often rising to over 3000, its rigorous climate and severe winters, with snow lying long on the ground; its generally shallow and unfertile soil and wide extent of desolate moors; its ill-drained valley floors over which fog frequently broods;—these and other disadvantages render the exploitation of its surface by its inhabitants a task of unusual difficulty. Offering, besides, few if any facilities for communication, it has remained apart from the activities of the surrounding regions. But a small proportion of the surface is fit for cultivation, moorland occupying in many communes half the total area. The arable lands, lying as a rule intermediate between the upper moorlands and the sour and swampy tracts in the valley bottoms, occupy specially selected

positions, especially those whose favourable aspect gives them warmth and shelter. Unable to produce wheat, they grow chiefly rye, buckwheat, potatoes, and oats, all the produce being consumed in the district either by the people or their stock. Cattle and sheep rearing—the former on irrigated meadows, the latter on the higher natural pastures—form its main resource, though within recent years forestry has made some strides, extensive plantations of pines having been established with success on the poorer soils. The above conditions are reflected in the distribution and mode of life of the people. Population is widely scattered, but not, as is often the case, in isolated homesteads, but in a large number of small agglomerations—the village forming the fundamental type of rural association. The houses and farm buildings themselves show special adaptations to local conditions. Unable itself to support a large population, the "Montagne" has for centuries seen a periodic emigration of its able-bodied men, who start early in the year to seek work elsewhere, either as masons, navvies, or even wine traders; leaving the harvesting of the crops to the women, children, and the infirm, and only returning with their earnings at the approach of winter. This, while prejudicial to the agriculture of the district, has encouraged progress by affording contact with the outer world, and has had an important effect on the land tenure, the money brought into the country favouring individual ownership by the actual cultivators, while communal ownership is nearly a thing of the past. While portions of the area remain isolated and keep up their old customs (thus the use of the flail is still general in the less accessible parts), the advent of railways has already done much to establish relations with the outside world, and to transform the conditions of life within the district.

ASIA.

Austrian Expedition to Mesopotamia, 1910.—Brief mention may be made of an Austrian expedition, mainly for purposes of botanical and zoological research, of which a report appears in the September number of *Petermanns Mitteilungen*, from the pen of Dr. V. Pietschmann. Dr. Pietschmann, who undertook the zoological work, had as colleague Baron Handel-Mazzetti, who went as botanist. The outward journey was made by the usual route from Aleppo to Baghdad along the south-west bank of the Euphrates, and the results here consisted chiefly in observations on the range of the animals, fishes, plants, etc., of the region, with collections of the same. Tortoises, of two species, are mentioned as specially characteristic of the Euphrates and Tigris, while the occurrence of a species of herring so far from the Persian gulf as Baghdad is also commented on. From Baghdad the party went north to Mosul, and thence crossed northern Mesopotamia from west to east at its widest part, striking the Euphrates once more at Rakka. On this stretch the travellers were able to make some minor rectifications of the maps, especially as regards Lake Katunie and the neighbourhood of Jebel Abd el Asis, the former being found to have quite a different shape to that given it in Kiepert's map of Asia Minor. Interesting observations were also made in the volcanic district of the Tell Kokeb, near the bend of the Khabur. The latter part of the journey to Rakka was made under some difficulties, the water-supplies being brackish and otherwise hardly drinkable from the enormous numbers of dead locusts. At Rakka the travellers separated, Dr. Pietschmann continuing his researches in the region to the north, visiting Urfa, Diarbekir, and the upper Tigris. The Karaja Dagh, beyond Urfa, marking the last outlier of the Kurdistan mountains, was found, as was to be expected, to constitute the limit of many species of animals. A photographic survey of much of the country

traversed, as well as a route survey with compass and aneroid, will supply material for the mapping of the region visited. The photographic survey is fully discussed in the *Mitteilungen* of the Vienna Geographical Society, 1911, No. 8.

A Visit to Mount Batu Lawi, Borneo.—Batu Lawi is a lofty mountain in the interior of Sarawak, regarded with a certain amount of superstitious awe by the inhabitants, and never, until the present year, actually reached by white men, although Sir Spencer St. John approached within two days' walk of it during his journey up the Limbang river in 1858, and it has since been seen at various times from elevated points in the surrounding country. In May of this year a collecting expedition to the mountain was undertaken, with the Rajah's sanction, by Mr. J. C. Moulton, curator of the Sarawak Museum, whose report on the trip is printed in the *Sarawak Gazette* of August 1. The great obstacles to an approach to the mountain are the violent rapids on the Limbang and its liability to sudden freshes, during which progress upstream becomes impossible. A previous attempt by Mr. Moulton in 1910 had been frustrated in this way, but this year he was fortunate in avoiding freshes, and thus took only two and a half days to cover a stretch which had taken seventeen the previous year. The party started from Kuching on May 2, and on May 15 reached the mouth of the Madihit, in the Kalabit country, travelling in boats paddled by relays of natives, and spending most of the nights at native houses, at which the traveller was hospitably received. On the 18th, as the Madihit had become impracticable for boats, the long overland walk to Batu Lawi was begun. The way led through a mountainous country, covered with dense jungle, into which the sun rarely penetrates, and where the midday shade temperature fell as low as 66° Fahr. Various mountain streams had to be crossed and recrossed, and pouring rain also added to the difficulties. Climbing a mountain 4850 feet high, which was taken to be Mount Selimguid, Mr. Moulton obtained a view of Batu Lawi across a narrow valley. The shortness of the food-supply made it necessary to push on with thirteen men only. A way was cut down the mountain by strenuous labour, and, after crossing a mountain torrent, the foot of Batu Lawi was reached, and a camp made on a spur 4900 feet in altitude. By 10 a.m. the next day an altitude of 6660 feet was gained in driving mist, but the steep and slippery nature of the ground then made it necessary to turn back. At this point the summit of the mountain was visible as a limestone column 600 feet high, rising sheer, and for the last 200 or 300 feet practically devoid of vegetation. During the return shortage of food involved several forced marches, but before reaching the Madihit, Mr. Moulton left the main body and took a new route by the Seridan river to the Baram district. A pleasant feature of the expedition was the invariable welcome received at every house, which, considering the diversity of the tribes met with, spoke well for the regard in which the Sarawak Government is held throughout the country.

A New Bay on the South-West Coast of Java.—We have been favoured with an extract from the *Nieuwe Rotterdamsche Courant* of September 7, 1911, describing the discovery of a hitherto unknown bay on the coast of Java, which appears likely to prove of some importance as a shelter to ships visiting that coast. It is situated on the south coast of the Preanger residency, near the cape called Ujung Genteng, which is the most prominent projection on the south-west coast of the island. This is probably the least-known portion of the coast-line of Java, just as in the early days of European intercourse with the island it was almost the last part to be visited by ships. Even now it is avoided as far as possible owing to the danger to shipping caused by the huge

rollers of the Indian ocean which dash against the rocks. The bay, which for the sake of convenience is at present called Genteng bay, forms a natural harbour with a narrow entrance, which still nowhere falls below the width of 165 yards. There are no reefs or similar dangers, and it is possible for ships to approach close to the shore. The bay seems first to have been brought to notice, some time ago, by a settler named Du Perron, who, on being guided to it by native reports, obtained the despatch of a Government steamer with a view to its examination. This was prevented by the heaviness of the surf, and only some time later was the bay examined by an officer sent by the Royal Packet Company, who made a chart which was sent to the Dutch Department of Marine. Arrangements had been made at the time of writing for a steamship to proceed to the bay with a cargo of goods, and so inaugurate its use for commercial purposes. Owing to the absence of easy land-communication with this part of Java, it is thought that the safe harbour provided by the bay should play an important part in its development.

The Flora of Mount Pulog, Luzon.—The *Philippine Journal of Science* contains, in the numbers for September and November, 1910, the results, brought together by Messrs. E. D. Merrill and M. L. Meritt, of a very complete botanical survey of Mount Pulog. During the Spanish occupation this mountain seems, from its somewhat hidden position 60 miles from the coast, to have been but little known, and it is to Mr. Charles Benson (apparently of the United States), whose party first made the ascent, that geographers owe the knowledge of its being the highest mountain (9480 feet) in the Philippines. "On January 5, 1907," reported Mr. Benson, "we ascended Mount Pulog, 9500 feet, and passed a night on its summit, the next morning having the delight and surprise of seeing over half an inch of ice on the pools of water just below the peak." The ascent was again made in January, 1909, by Mr. M. L. Merritt and others, and their determination of the mountain's height agrees substantially with that of Mr. Benson. In the ascent of Mount Pulog ("Pulog" or "Pulag," according to the Igorots, signifies "steep-sided") four main vegetation zones are encountered, controlled in the main by differences of temperature and moisture rather than by geological factors. The steep lower slopes below an altitude of about 4000 feet are grass covered, and in the more moist ravines and gullies a few broad-leaved shrubs and small trees occur. Then succeeds a pine region occupying the main bulk of the mountain slopes and covering the summits of most peaks and ridges that do not exceed 6000 feet. The characteristic species is *Pinus insularis*, Endl., which forms an open park-like forest. The trees are mostly scattered, and their tops are greatly wind-shattered. In the gullies and stream depressions of the pine zone broad-leaved trees and shrubs are quite common, whilst in the open slopes the ground cover consists of grasses like *Themeda triandra*, Forsk. Above the pine region comes a characteristic formation that is generally called the mossy forest, consisting of dense wood of small irregularly shaped trees of various species. The branches and trunks of the trees, and also the ground, are covered with a profusion of mosses, lichens, and epiphytic ferns and orchids. The forest zone presents a peculiar greyish shade, owing partly to the colour of the leaves and partly to the lichens, and being at so high an altitude is much wind-harassed. On neighbouring mountains of similar elevation the mossy forest extends to the summit, but Mount Pulog is unique in that the forest stops at an altitude of about 8000 feet, giving place to summit grass-lands. The entire top is practically a large meadow with deep rich soil and few rock outcrops. A more delightfully refreshing kind of mountain-top for a tropical land one could hardly wish for.

AFRICA.

Game Preservation and Disease in Africa.—A recent Parliamentary Paper (Cd. 5775, 1911) embodies correspondence which has taken place in reference to the game reserves, which, as is known, have been set apart in the various African Protectorates. It appears that a considerable feeling has lately arisen in various quarters against the maintenance of these reserves, at least in the particular neighbourhoods in which they have been established, and some modifications of the ordinances by which they were constituted have already been made. In some cases the complaint has been that the reserves are so situated that the destruction wrought by elephants, etc., causes grave loss to cultivators in their neighbourhood, but a still more serious indictment is the supposed encouragement afforded by the game to the increase of the tsetse fly and the resulting spread of disease, especially sleeping sickness. The most urgent appeal for a revision of the game regulations on this score has come from Nyasaland, where sleeping sickness has unfortunately become established, and where a great increase in the numbers of tsetse in the vicinity of the game reserves has been noted. Missionaries, traders, and settlers have been nearly unanimous in urging the destruction of the game, a special criticism being directed against the nearness of the existing reserves to thickly populated districts. Before deciding on any drastic action, reference was made by the Colonial Office to the Sleeping Sickness Bureau in London, and a reply from Dr. Arthur Bagshawe, the director, is printed, which judiciously sums up the points at issue, and, after deprecating hasty action, urges the sending out of a commission to inquire on the spot into the relation of the African fauna to the maintenance and spread of human trypanosomiasis, as well as of other trypanosome diseases of domestic animals. This suggestion has already led to definite action, the Royal Society having, in April last, at the request of the Colonial Office, undertaken the direction of the Commission, which is to continue its labours for three years at a cost not exceeding £5000 yearly. It has been placed under the direction of Sir David Bruce, and includes also Captain Hamerton, Prof. Newstead, and others. Its sphere of work will be in Nyasaland, where, owing to the apparent absence of the form of tsetse which carries the germs of sleeping sickness elsewhere, it seems possible that some other fly may be the host. In Uganda the solution of the problem, for the time at least, seems to have offered less difficulty. Owing to the sleeping sickness, it was found necessary to remove the population from a large tsetse-infected area between Fajao and Foweira, and this area has now been added to the game reserve (to be known in future as the Bunyoro Game Reserve), while the Budongo forest, where much damage by elephants had been complained of, has been placed outside the reserve. A modification of the previously existing game ordinance, with a view to protecting the populated districts from the ravages of elephants, has also been provisionally sanctioned. In the East Africa Protectorate the proposal to throw open the Southern Masai reserve has been under consideration, as its maintenance is considered incompatible with the prosecution of farming in its neighbourhood.

Hydrographical Work in West Africa.—Accounts have lately been given in the *Quinzaine Coloniale* of the results to date of Captain Audoin's mission to the coast of French Equatorial Africa, for the study of the conditions of navigation and the best site for the establishment of a port, and also of that under M. Roussilhe for the study of conditions of navigation on the Congo, Ubangi, Sangha, etc. In the south Captain Audoin paid special attention to the stretch between the Kwilu and Loeme rivers, as the part of the coast from

which an eventual railway towards Stanley pool would start. He found that the conditions would be favourable for a port either at Loango, or at Black point a little further south, preference being given, however, to the latter. At present there is but an open roadstead, but by the construction of a breakwater and other works it would be possible to turn the place into a port of the first rank. Besides the purely hydrographical conditions, the topography, climatology, hygienic possibilities, water-supply, and the resources of the district in building materials, etc., were carefully studied. Captain Audoin's report is already being acted on to some extent, as orders have been given for the construction of a wharf and warehouses at Black point. A study has also been made of the region of Cape Lopez and the lagoons to the south of it. With suitable improvements, it is considered that the port of Manji, near the cape, will become the chief outlet for this part of the possession. Improvement of the navigable channel of the Ogowe is thought possible and desirable, while a scheme is put forward for the opening of an "inland navigation" by means of the coastal lagoons, similar to that on the east coast of Madagascar by the Pangalanes channels. M. Roussilhe has already carried out detailed surveys of the Sangha and Ngoko as well as on Stanley pool. In the former region, he has proved that any attempt to improve the navigation of the Sangha above Wesso would be too costly to be practicable, but that it should be possible to make the Ngoko navigable throughout the year. Future studies will be concerned, *inter alia*, with the problem of improving the difficult pass of Zinga on the Ubangi.

Geographers and Tripoli.—In view of the present operations in Tripoli, Sir Clements Markham sends us the following note: "Tripoli and Cyrenaica are regions which must always have a special interest for geographers. Eratosthenes, the founder of the science of geography, more than two thousand years ago, hailed from Cyrene. The Nasamonian youths, immortalized by Herodotus, starting from the shores of the Gulf of Syrtis, were the first African explorers. In modern times Tripoli has been the starting-point for explorers from the days of Clapperton to those of Barth and later. The coasts of Tripoli and Cyrenaica were surveyed by two presidents of our Society, Admirals Smyth and Beechey, from Tripoli to Derna, one from his ship the *Adventure*, the other travelling along the shore. If Italy undertakes the responsibilities of this region she has a great task before her. It was once one of the most flourishing provinces of the Roman Empire. It is now practically a desert. While administrators strive to effect some approach at restoration, the physical geographer has a most important field of research before him. The best books on Tripoli, and very excellent books they are, are those of Beechey, of Lyons, and of Murdoch Smith and Porcher."

AMERICA.

The Survey of Colombia.—We referred last year (vol. **35**, p. 81) to the establishment at Bogotá of an "Office of Longitudes" entrusted with the execution of the necessary surveys to serve as the basis for an accurate map of Columbia. The first campaign in the field for this object was undertaken early in 1910, lasting seven months and resulting in the collection of a large mass of material. The director of the office, Señor Julio Garzón Nieto, who carried out the work with the assistance of Señors Garavito and Ucrós, has presented a report, which is printed in the *Boletin del Ministerio de Relaciones Exteriores*, and which, besides dealing with the technical part of the work, includes, under the narrative of the journeys, a large amount of useful information on the geography and economic condition of the districts visited, some of which were

quite off the beaten track. The party descended the Magdalena to the sea, then following the coast westward to the mouth of the Atrato, and making its way across to the Pacific by its valley. From Buenaventura, after carrying out a survey of the Pacific coast, the party crossed over into the valley of the Cauca, to which the rest of the time was then devoted. The work accomplished is thus summarized: 592 astronomical observations, with the associated meteorological data, were secured, as well as 652 independent meteorological observations; 514 exchanges of signals by telegraph were made. Surveys were made of the Magdalena from Girardot to Baranquilla; of the Atlantic coast from Barranquilla to the Rio de la Miel; of the Atrato from the Boca del León to Quibdo; of the Rios Bojayá, Uva, Napipi, and Limón (in the upper basin of the Atrato and between this and the Pacific); of the Pacific coast from the Bahía de Limón to Panamá; and of the Cauca from Cali to Cartago. All these surveys were referred at frequent intervals to points fixed astronomically. Barometric leveling was also carried out on all the overland journeys. So far as tested the results appear to be most satisfactory, and in the case of a telegraphic longitude obtained in two different ways, the divergence amounted to only 0·3 second. The operations involved much arduous labour, and the party was more than once in peril while navigating along dangerous parts of the coast, or on the flooded streams between the Atrato and the Pacific. Very heavy rains were experienced here, and one of the members of the party suffered from severe attacks of fever. Parts of the Atlantic coast were also found to be malarious. Information is given as to the population of the towns and their industries, as well as of the activity in the way of planting, rubber collecting, etc., of which a good deal is being displayed on the shores of the Gulf of Uraba. Quibdo, on the upper Atrato, which exports a considerable quantity of gold, platinum, etc., had the aspect of a regular workshop, and it is thought that with the development of communications, this part of the state will make still further progress. The country between the Atrato and the Pacific was, however, practically a wilderness. Buenaventura, whence a railway is in course of construction towards the valley of the Cauca, is placed on a low and unhealthy site, depending only on rain for its supply of water, and Señor Nieto expresses surprise that it should ever have been chosen, especially as a far better site might have been found at no great distance.

The Yale Expedition to Peru.—Prof. Hiram Bingham, whose expedition to Peru, supported by Yale University, was referred to in vol. **37**, p. 566, writes under date August 3, 1911, giving a brief account of the work done by his party during the five weeks that had elapsed since their arrival. Near Cuzco, Prof. Bingham had made the interesting discovery of human bones in a deposit which, in the opinion of the geologist of the party, Prof. I. Bowman, certainly dates from the Glacial period. The bones, which were covered by over 100 feet of conglomerate, gravel, sand, etc., had been partially exposed to view owing to erosion and the cutting of a road in the side of the valley. They included three femora and one hip-bone. Another important discovery was that of a ruined Inca city, placed on an almost inaccessible ridge flanked by fine precipices not far from the left bank of the Urubamba, three days' journey from Ollantaytambo. Prof. Bingham says that among all the Inca cities that he has visited, none even remotely approaches this in importance. The ruins are very extensive, and the stonework is as fine as any in Cuzco or Ollantaytambo. One building is remarkable for its large and beautiful windows, another for its finely worked stones, some of them 13 and 14 feet long. Prof. Bingham believes the city to have been the ancient Pitcos (Vitcos), or Pitchu, mentioned by

Father Calancha and also by Ocampo. The latter says that Pitcos "is in a very high mountain . . . where there is a plaza of considerable size," and describes the buildings as "suntuosisimos de grande magestad," and built with great art. The place is now known as Machu Pichu, *i.e.* Old Pichu, but it is so difficult of access that no one in the neighbourhood has seen it. Prof. Bingham, who had taken a number of photographs of the ruins, hoped to return shortly and spend some time making a plan of them and clearing away the jungle by which a large part is covered.

Exploration of the Ibera Lagoon, Argentine Republic.—The Ibera lagoon or marsh, lying between the Paraná and Uruguay on the borders of the province of Corrientes, is one of those areas which, owing to their trackless nature or doubtful value for utilitarian purposes, have remained partially unknown in the midst of a civilized community like the Argentine Republic. For some time, however, a movement has been on foot for the removal of this reproach by a thorough examination of the lagoon from a scientific point of view; and though the promoters for a time met with but slight response, their efforts were at last successful. The vote of the necessary funds by the Argentine Chamber enabled the Sociedad Cientifica Argentina, which had zealously supported the project, to organize an expedition early last year under the leadership of Lieut.-Colonel Pedro Uhart, for whose guidance detailed instructions were drawn up. They are printed, together with a full account of the course af the movement, in the *Anales* of the society above mentioned for November, 1910. A solution of the following, among other questions, was aimed at. Does any connection exist between the rise of the Paraná and the increase of lagoon water? Are there movements of water in the basin? Do traces exist in the neighbourhood of an ancient bed of the Paraná? What is the relative extent of open water and of reed-beds, etc.? Would a drainage of the swamp be desirable? Geological, botanical, and zoological observations and collections were also to be made, and the possibilities of cultivation, acclimatization of fish, etc., were to be considered. From a statement by the President of the Sociedad Cientifica Argentina, in his annual address in April last (*Anales*, April, 1911), it appears that the exploration was then approaching completion, and that an account of his operations was expected from Colonel Uhart. It has not, however, appeared in any of the numbers of the *Anales* received up to the present date.

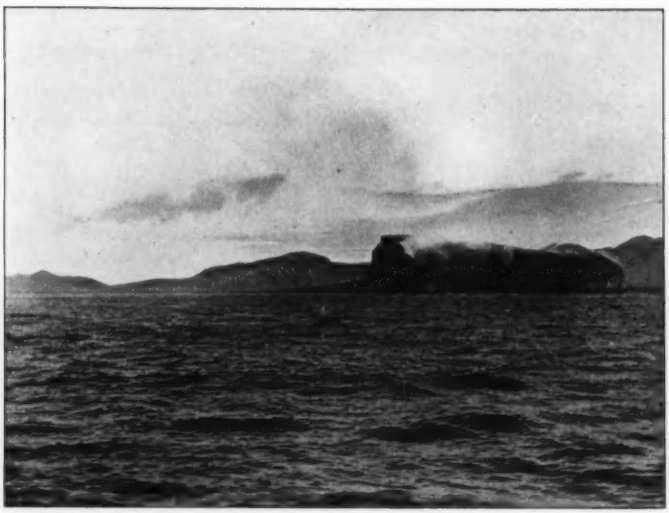
AUSTRALASIA AND PACIFIC ISLANDS.

Plant-growth in a New Zealand River-Bed.—It is not often that the actual process of occupation of a new land-form by plants can be studied, but this can be done in certain cases, *e.g.* that of newly fixed sand-dunes, where the evolution of the new feature and its covering by plants are almost synchronous. Dr. Cockayne, whose researches in New Zealand ecology have several times been referred to in the *Journal*, has lately studied the spread of plants in the case of one of the stony sub-alpine river-beds of the southern Alps—that of the Rakaia—and has given the results in the *Transactions of the Botanical Society of Edinburgh* (vol. **24**, pt. iii.). He points out that the study is of interest, both as throwing light on the evolution of the steppe-vegetation of the New Zealand plains formed during the Glacial period, and from its economic bearing in relation to the formation of grazing-ground for sheep. The sub-alpine river-bed of the Rakaia is typical of such features on the eastern side of the southern Alps. An immense amount of morainic matter is brought down by the glaciers and spread over the whole width of the valleys, which have no high or permanent terraces, the river-beds filling the whole space between the mountain walls. Through

the mass of *débris* the streams wander in constantly changing channels, but though newly established vegetation is thus liable to be soon swept away, there are remnants of old flood-plains and other isolated spots on which a closed covering has in course of time been formed. Thus every phase of development can be studied from the first insecure occupation of the ground to its final conquest by steppe, shrubbery, or forest. The climatic conditions are partly hygrophytic, partly xerophytic, the effect of the abundant rain being neutralized by the insolation, the frost, and above all the high winds. Until humus is formed, the soil conditions are largely those of a desert, the stony *débris* being deficient in nutritive salts, while its porous nature causes it to dry quickly, so that the plants depend almost entirely on rainfall for their water-supply. Among the plants which by their growth-forms play a special *rôle* in the development of a permanent covering, various species of *Raoulia* are particularly important. They help to form a distinct association, growing in patches or cushions, within which peat and humus accumulate and afford a footing to other plants whose seeds fall on the cushions. As the bare spaces between the tussocks became filled and the number of other species increases, a steppe is formed, and this in time gives place to scrub—the final association in the case of the Rakaia. This is simply sub-alpine scrub which has descended to the river-bed, while the earlier associations also have their counterparts, either on the lowlands or on the mountain slopes.

The Exploration of Dutch New Guinea.—Various items of news in connection with the exploration of Dutch New Guinea are to be found in the last two numbers of the *Tijdschrift* of the Netherlands Geographical Society. The expedition under Captain Schaeffer to the region of the Island river, to which reference was made in the July number (p. 77), had been forced by the ill health of some of its members to turn back without carrying out the suggested crossing to the north coast of the island. But it had done a considerable amount of survey work in the mountains, and attention will, it seems, be directed to a further examination of the southern river systems. The invalided members have been replaced by Messrs. Le Cocq d'Armandville, Helb, and Andreae. This expedition, like that of Mr. Goodfellow and Captain Rawling, came in touch with the dwarf tribes of the interior, and some notes on these, made by Dr. de Kock, one of the members of the party, together with a photograph of four men and a child, are given in the September number of the *Tijdschrift*. Further information is also given on the explorations by Captain Koch in the region of McCluer gulf (July number, p. 78). This explorer had crossed the narrow neck northwards to Geelvink bay, and after various excursions had returned to the south coast, hoping afterwards to cross once more to the north from a starting-point on Triton bay. This same region was also the scene of explorations in 1906 by Mr. W. den Berger, Dr. H. Hirschi, and others, who likewise crossed the neck and found its width to be only 11 kilometres—much less than had been shown in the maps. On the northern side of the island, a survey was made early in 1911, by Captain F. J. P. Sachse, of Lake Sentani, an irregular piece of water inland from Humboldt bay measuring some 20 miles along its curved axis. Captain Sachse's map is reproduced in the September number of the *Tijdschrift*, together with a survey by Lieut. J. E. Scheffer of the Koime river, which unites with the Jafuri, the effluent of Lake Sentani. Lastly, some notes are given by Prof. J. F. Niermeyer on the remarkable "Karst" lake of Kamaka Wallar in the limestone region of South New Guinea, discovered by D'Albertis in 1874, the level of which appears to fluctuate greatly. A photograph of the lake, taken by Dr. Hirschi, accompanies the paper.

EAST SIDE OF MOUNT BEERENBERG, JAN MAYEN.



EGG BLUFF CRATER, JAN MAYEN, SHOWING STEAM ISSUING FROM THE WALLS.

Further Exploration of the Kaiserin Augusta River.—An important expedition is being organized in Germany for the further exploration of the region of this river, to which renewed attention has lately been directed by the work of the recent German-Dutch boundary expedition. The project was warmly supported by Prof. Penck, who urged its importance in a paper printed in the *Zeitschrift* of the Berlin Geographical Society, 1911, No. 6. In June a vote of sixty thousand marks towards the expenses of such an expedition was made by the German Colonial Society, and the undertaking also has the support of the German Colonial Office. From the *Kolonialzeitung* for September 21 we learn that mining assessor Stolle has been chosen as leader of the party, which will also include a geographer, an ethnologist, a zoologist, and a botanist. The expedition will have at its disposal a small steamer now being built at Hongkong, which is to be called the *Kolonialgesellschaft*, and of which particulars are given in the *Kolonialzeitung* for September 30.

POLAR REGIONS.

The Duchess of Bedford's Visit to Jan Mayen.—We have received from Her Grace the Duchess of Bedford some notes on a visit paid by her last summer to the island of Jan Mayen in the *Sapphire*, a steam yacht of 1025 tons. The accompanying illustrations are reproductions of two out of a series of excellent photographs sent at the same time. The voyage from Grimsey (north of Iceland) was begun on July 29. Ice had been seen from that island a few days before, and both there and at Akureyri the prospect of reaching Jan Mayen was considered very remote, owing to the amount of ice experienced on the coast of Iceland during the winter and spring.* At the Hellisfjord whaling station ice had remained till May, and to this fact was attributed the badness of the whaling and fishing season. However, past experience seems to indicate, as mentioned in the 'Arctic Pilot,' that the years in which ice abounds on the coast of Iceland are those in which Jan Mayen is most accessible; and this seems borne out by the state of things in the present year, for, apart from a distant iceberg sighted from the *Sapphire* when about 30 miles north-east of Grimsey, no ice was seen during the whole voyage. Early on July 30 Jan Mayen was visible as a dim outline of dark cliffs, shrouded above in mist and cloud. Great numbers of Brünnick's guillemot, fulmars, and a few kittiwakes were flying round the yacht. Soon the snow-covered cone of Beerenberg appeared above the clouds, and as these cleared off, the tops of cliffs green with vegetation came into view. On the whole southern half of the island the snow had almost entirely melted, only small patches remaining in the deepest crevices. Beerenberg, as will be seen from the accompanying view, is far from presenting the towering appearance represented in some early accounts, and though the mountain is said to be inaccessible ('Arctic Pilot,' vol. 2, p. 19), it is hard to believe that it would prove so to an experienced climber. Her Grace also dissents from Scoresby's statement that the general appearance of the land bears a striking resemblance to Spitsbergen, as the many jagged peaks of the latter are entirely absent, and, apart from the Beerenberg, the island as seen from the east and south-east is low and studded with huge rugged craters. The cliffs are of a rusty red colour mixed with the black of the lava, and the comparatively small glaciers look like masses of compressed dirty snow, instead of presenting the walls of clear blue ice so

* We have received information showing that the ice-conditions off Spitsbergen were likewise unfavourable during the same period.

characteristic of Spitsbergen. Dufferin glacier seems to have entirely disappeared. The sea on the east coast being very calm, the yacht steamed in towards the Wille glacier, but the surf prevented a landing. Numbers of glaucous gulls, guillemots, and fulmars were seen, but until a gun had been fired the cliffs showed none of the signs of breeding birds which characterize other great resorts of sea-fowl in the breeding season. Possibly this is owing to the nature of the soil and the less precipitous form of the lava slopes. The direction of the wind making it inadvisable to steam down the west coast, the *Sapphire* returned by the way she had come, the whole of the weird and beautiful island being seen in a perfectly clear atmosphere and in cloudless sunshine. On leaving the island the yacht ran into a heavy bank of fog, and the next day experienced a bad gale from the east and south-east. Bakka fjord in Iceland was, however, safely reached on August 1. The *Sapphire* was slightly ahead of her log on reaching Jan Mayen, possibly owing to current; but it is pointed out that the distance from Iceland on the chart is greater than that given in the Sailing Directions. The temperature of the sea, as noted from time to time in the narrative, varied between 36° and 42°, the air-temperatures observed being not very different.

Research Work in Spitsbergen.—Expeditions to Spitsbergen for scientific or economic researches have become so numerous that it is impossible to chronicle them all. The discovery of coal in the region of Advent bay, and the activity of various undertakings for its exploitation, have drawn special attention to this part of the group. Among the expeditions which went to Spitsbergen during the summer of 1911 were a Norwegian, under Messrs. Hoel and Staxrud; a German, under Drs. Remp and Wagner; and a Swedish under Mr. B. Högbom, son of the well-known geologist, Prof. A. G. Högbom. The Norwegian party proposed first to carry out topographical surveys, in continuation of previous work of the same character, in the region between Ice fjord and Bell sound (including the measurement of a base on Axel island) and in that of Wijde bay and Wood bay. Afterwards attention was to be devoted to the examination of the volcanic district discovered by Mr. Hoel in 1910, in the north of Spitsbergen. The object of the German expedition was to continue the meteorological observations begun the year before in connection with the Zeppelin airship expedition. It was proposed to establish a station on the shores of Advent bay, and the observers will spend at least one winter in the group in order to continue the observations through an entire year. Mr. Högbom's special work was to be an examination of the deposits of coal and gypsum.

Captain Bernier's Arctic Expedition.—News has been received of the arrival in the St. Lawrence of the *Arctic*, Captain Bernier in command, which sailed north a year ago with the hope of making the North-West Passage by way of Melville island (*Journal*, vol. 37, p. 98). The enterprising voyager has thus failed in his main object, but from the scanty details yet to hand, he seems to have done some good work, notably in the survey of the previously unknown coast of Baffin land between Fury and Hecla strait and Cape Kater. Captain Bernier seems to have completed the greater part of the passage and to have reached the neighbourhood of Banks land before turning back, but the statements in the telegram are somewhat obscure.

Rasmussen's Expedition to Northern Greenland.—News has reached this country that Mr. Knud Rasmussen's projected expedition across the northern extremity of Greenland has had to be abandoned, owing to the unfavourable conditions prevailing this year. His companion, Herr Freuchen,

who in February had made a trip across Melville bay to Tasiussak, was much impeded on the return by heavy snow and a partial thaw, and owing to the impossibility of making progress under such conditions, was forced to leave his goods at Thom island. Food also ran short, and he arrived at Cape York on April 22 in an exhausted state. Other reports being unfavourable, Rasmussen gave up his original plan, and started for Ellesmere land and Jones sound, but was attacked by illness and with difficulty made his way back. The last hope of receiving news of the missing explorer Mikkelsen during the present year seems, therefore, to have been removed.

The Antarctic Expeditions.—Captain Scott's ship, the *Terra Nova*, reached Lyttelton, N.Z., on October 7, and will sail south to communicate with the explorer and his party on December 1. Captain Amundsen's ship, the *Fram*, has already sailed south from Buenos Aires for the Ice-barrier in order to bring back the Norwegian party, and there seems to be some idea that communication with this may be established before the end of the year, which would mean that the southern journey had been undertaken at an unusually early date. Dr. Mawson's expedition will, according to present arrangements, leave Australia on November 27. It will have been joined before then by Mr. E. E. Joyce, a member of Captain's Scott's first expedition, who before leaving this country received a message from the King conveying to Dr. Mawson and his party his "best wishes for success, good health, and safe return." The funds of the expedition have now reached a total of £43,000.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Methods of investigating Variations of Rainfall.—The *Meteorologische Zeitschrift* for March, 1911, contains a long technical paper by Dr. Hans Maurer entitled "Zur Methodik der Untersuchungen über Schwank ungen der Niederschlagsmengen." He points out the importance, in respect of agricultural conditions in the German African colonies, of studying extreme variations of rainfall according to absolute quantities, instead of merely representing the variations as a quotient of the wettest by the driest year. In the case of extensive areas with different types of seasonal distribution of rainfall as in German West Africa, a map of variation-quotients would afford quite useless information.

GENERAL.

The Lectureship in Geography at Glasgow University.—The appointment of a successor in this lectureship to our Honorary Secretary, Captain Lyons, was made early in October, the choice falling on Dr. J. D. Falconer. Dr. Falconer, who was for a time assistant to Prof. James Geikie, has done good work in connection with the mineral survey of Nigeria. The opportunity thus offered for a scientific study of that region has yielded fruit in the work on 'The Geology and Geography of Northern Nigeria,' which was reviewed in the August number, p. 193. He had previously given some of the results of his studies at a Research Meeting of the Society. Another item of news from Glasgow is of interest to geographers, viz. the approval of a new ordinance, by which geography is accepted as a subject which may be offered in the final examination for the B.Sc. degree.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.k = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic. *M. k.k. G. Ges. Wien* **54** (1911): 192–226. **Brückner.**

Vorläufiger Bericht über die erste Kreuzungsfahrt S.M.S. *Najade* in der Hochsee der Adria, 25. Februar bis 7. März 1911. Im Auftrage des Vereines zur Förderung der naturwissenschaftlichen Erforschung der Adria, erstattet von Prof. Dr. Ed. Brückner. *Sketch-maps and Illustrations.*

See note in the September number, p. 322.

Adriatic—Istrian coast. **Götzinger.**

Bericht über die im Jahre 1909 ausgeführten ozeanographischen Untersuchungen entlang der Westküste Istriens und über die ozeanographische Ausrüstung des Forschungsschiffes *Adria*. Von Dr. Gustav Götzinger. (Sonderabdruck aus dem Jahresbericht des Vereines zur Förderung der naturwissenschaftlichen Erforschung der Adria.) [Linz, 1910.] Size 10 × 6½, pp. 22. *Illustrations.*

Alps. **Helbronner.**

Tours d'horizon photographiques de sommets, extraits du Tome I[er] de la Description géométrique détaillée des Alpes françaises. Par Paul Helbronner. Paris: Gauthier-Villars, 1911. Size 13¼ × 20. 18 *Panoramas*. *Price* 33.50 *fr.*

Alps. **Whymper.**

The Valley of Zermatt and the Matterhorn: a guide. By Edward Whymper. 15th edit. (pp. xiv. and 224). Chamonix and the range of Mont Blanc: a guide. By the same. 16th edit. (pp. xiv. and 206). Size 7½ × 5. *Maps, Plans, and Illustrations. Price (each)* 3*s. net. Presented by the Author.*

Alps, Central. **Ball.**

The Alpine Guide. The Central Alps. Part II. (including those Alpine portions of Switzerland, Italy, and Austria which lie south and east of the Rhone and Rhine, south of the Arlberg and west of the Adige). By the late John Ball. New edition, revised and reconstructed on behalf of the Alpine Club under the general editorship of George Brooke. London: Longmans & Co., 1911. Size 7½ × 5, pp. xviii. and 432. *Maps. Price* 7*s.* 6*d. net. Presented by the Publishers.*

Alps—Lakes. **Steiner.**
Internat. Rev. Hydrobiologie, etc. **4** (1911): *Biolog. Suppl.* [No. 3], pp. 72.
Biologische Studien an Seen der Faulhornkette im Berner Oberland. Von G. Steiner. *Sketch-map and Illustrations.*

Austria—Gulf of Trieste. **Merz.**
Hydrographische Untersuchungen im Golfe von Triest. Von Dr. Alfred Merz. (Besonders abgedruckt aus dem LXXXVII. Bande der Denkschriften der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften.) Vienna, 1911. Size 12½ × 9½, pp. 108. *Map and Diagrams.*

Balkan Peninsula. **Cvijić.**
Royal Servian Academy of Sciences. Sketch of the geography and geology of Macedonia and Ancient Servia, with observations on Southern Bulgaria, Thrace, the neighbouring regions of Asia Minor, Thessaly, Epirus, and Northern Albania. By J. Cvijić. Vol. 3. Belgrade, 1911. Size 13 × 9½, pp. viii. and 689–1272. *Maps, Illustrations, and Sections. Presented by the Author.* [In Servian.]

Belgium—Rivers. *B.S. Belge Géol.* **24** (1911): *Mém.* 439–453. **Hasse.**
Les Schijns et l'Escaut primitifs à Anvers. Par Georges Hasse. *Plans, Sections, and Illustrations.*

Belgium—Scheldt Basin. *B.S. Belge Géol.* **24** (1910): *Mém.* 385–413. **Lorié.**
Le Diluvium de l'Escaut. Par le Dr. J. Lorié. *Sketch-maps and Sections.*

Belgium—Water-supply. *B.S. Belge Géol.* **25** (1911): *Proc.-Verb.* 7–56. **Deblon.**
Alimentation en eau potable de la Basse-Belgique et du bassin houiller de la Campine: De la valeur des eaux de la Campine. Par A. Deblon. *Sketch-map, Plans, and Sections.*

Central Europe—Place-names. *Petermanns M.* **57** (1911) [ii.]: 2–4. **Gradmann.**
Zur Geographischen Namenkunde Mitteleuropas. I. Schwäbischer Jura, Schwäbische Alb, Rauhe Alb. Von Dr. R. Gradmann.

Crete. *Rep. British Ass., Sheffield,* 1910 (1911): 228–256. **Myres.**
Archæological and Ethnological Researches in Crete. (Report of Committee, by Prof. J. F. Myres, Secretary.)

Europe—Phytogeography. **Thompson.**
Alpine plants of Europe, together with cultural hints. By Harold Stuart Thompson. London: G. Routledge & Sons, [1911]. Size 8½ × 5½, pp. xvi. and 288. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

France—Afforestation. *B.S.G. Com. Paris* **33** (1911): 193–215. **Descombes.**
La lutte contre les inondations par le reboisement. Par Paul Descombes.

France—Alps—Morphology. **Kilian and Reboul.**
Geol. Charakterbilder (Stille) **1** (1910): Heft 4, 7 plates.
Morphologie des Alpes françaises. Par W. Kilian et P. Reboul.

France, Central. **Gostling.**
Auvergne and its people. By Frances M. Gostling. London: Methuen & Co., (1911). Size 9 × 5½, pp. xx. and 292. *Sketch-map and Illustrations. Price 10s. 6d. net.*

France—Haute-Loire. **Boule.**
La Haute-Loire et le Haut-Vivarais. Guide du Touriste, du Naturaliste et de l'Archéologue. Par Marcellin Boule . . . (Collection publiée sous la direction de M. Boule.) Paris: Masson et Cie., 1911. Size 7 × 4½, pp. viii. and 366. *Maps, Illustrations, and Sections. Price 4.50 fr. Presented by the Publishers.*

France—Paris. *B.S.G. Com. Paris* **33** (1911); 404–416. **Blondel.**
Paris port de mer. Par Georges Blondel.
See note in vol. 37, p. 446.

Germany—Anthropogeography. *J.G.* **9** (1910): 1–8, 29–36. **Tarr.**
Man and His Environment in Germany. By R. S. Tarr.

Germany—Brandenburg. **Friedel and Mielke.**
Landeskunde der Provinz Brandenburg . . . herausgegeben von Ernst Friedel und Robert Mielke. II. Band: Die Geschichte. Berlin: D. Reimer, 1910. Size 11 × 7½, pp. xii. and 496. *Maps and Illustrations.*

Germany—Prussia—Land ownership. *Deutsche Erde* **10** (1911): 3–8. **Loesener.**
Besitzfestigung in der Preussischen Ostmark. Von Dr. Max Loesener. *Map.*

Holland—Schelde. *Z. Ges. E. Berlin* (1911): 365–400. **Müller.**
Zur Geschichte und Natur der Schelde-Mündungen in der Niederländischen Provinz Zeeland. *Maps and Illustrations.*
Noticed in the October number, p. 429.

Holland—Surface-features. **Bouwmeester.**
De ontwikkeling van Nederlands landschappen. Bijdrage tot de geschiedenis van Nederlandsche beschavings-toestanden, zooals die onder wisselwerking van bodem en mensch zijn ontstaan. Door Dr. W. L. Bouwmeester. The Hague: Gebroeders van Cleef, 1911. Size 10 × 6½, pp. xvi. and 444. *Sketch-map and Illustrations. Presented by the Publishers.*

Iceland—Geology. **Reck.**
Abh. K. Preuss. A.W. (1910): *Anhang, Phys. Abh.*, No. II., pp. 100.
Das vulkanische Horstgebirge Dyngjufjöll mit den Einbruchskalderen der Askja und des Knebelsees sowie dem Rudloffkrater in Zentralisland. Von Dr. Hans Reck. *Sketch-maps, Sections, and Illustrations.*

Italy—Anthropology. *Cosmos* **13** (1911): 175–185. **Livi.**
Distribuzione geografica della robustezza in Italia. Di Ridolfo Livi. *Sketch-maps and Diagrams.*

Italy—Apennines. *Cosmos* **13** (1911): 145–175. **Sacco.**
L'Appennino settentrionale e centrale. Sunto di Studio geologico del Prof. Federico Sacco. *Map.*

Italy—Sicily—Etna. *Riv. G. Italiana* **18** (1911): 205–212. **De Fiore.**
Il periodo hawaiano dell' Etna nel 1910–1911. Di Otto De Fiore.

Italy—Venetia. *Mem. G. Riv. G. Italiana* (1911): 185–244. **Toniolo.**
Studi sopra i limiti altimetrici. III. I limiti altimetrici nella Val Visdende (Comelico). Ricerche di Antonio Renato Toniolo. *Sketch-maps and Illustrations.*

Norway. ———
(Ward, Lock & Co.'s Guides.) Handbook to Norway. London: Ward, Lock & Co., [1911]. Size 7 × 4, pp. 176. *Maps, Plans, and Illustrations. Price* 2*s.* 6*d. net. Presented by the Publishers.*

Poland—Climate. **Romer.**
Esquisse climatique de l'ancienne Pologne. Par Eugène Romer. (From *Bulletin de la Société Vaudoise des Sciences Naturelles*, 5° S., vol. **46**, Juin 1910.) Lausanne, 1910. Size 8½ × 5½, pp. 203–233.

Rhine. *Petermanns M.* **57** (1911) [ii.]: 76–77. **Mordziol.**
Ueber die Gliederung des Rheinstroms in einzelne Abschnitte.
A plea for a natural division of the river's course into sections.

Russia—Seismology. *Zap. Novorossiisk Naturalists S.* **31** (1908): 129–181. **Vasileff.**
The seismology of Southern Russia and the neighbouring regions in relation to the land structure. By P. Vasileff. *Maps.* [In Russian.]

Scandinavia. **Cook.**
Cook's Handbook to Norway and Denmark, with Iceland and Spitsbergen. 8th edit. London: T. Cook & Son, 1911. Size 7 × 4½, pp. 292. *Maps and Plans. Price* 1*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—Climate. *Quart. J.R. Met. S.* **37** (1911): 105–124. **Mellish.**
The present position of British Climatology. By Henry Mellish. *Portrait and Diagram.*

United Kingdom—Kent. **Lewis.**
The Kent coast. By Arthur D. Lewis. [The County Coast Series.] London: T. Fisher Unwin, 1911. Size 8 × 5, pp. 320. *Illustrations. Price* 6*s. net. Presented by the Publisher.*

United Kingdom—Kent—Hydrology. **Cooke and Russell.**
Quart. J.R. Met. S. **37** (1911): 125–162.
Variation of the depth of water in a well at Detling, Maidstone, compared with the rainfall, 1885–1909. By Richard Cooke and Spencer C. Russell. *Diagrams.*

United Kingdom—Rivers. **Baldwin-Wiseman.**

The Association of Water Engineers. The Water Supplies of the river-basins of England and Wales. By William Ralph Baldwin-Wiseman. N.P. [1911]. Size 8 × 5, pp. 43. *Map. Presented by the Author.*

United Kingdom—Scotland. **Otter and McDougall.**

West Coast of Scotland Pilot, Part I., from the Mull of Galloway to Rudh Rè, including the off-lying islands northward to Coll, the small islands, the South-West Coast of Skye from Loch Brittle to Point of Sleat, and the East Coasts of that island, with Inner and Raasay Sounds. Originally compiled from various Admiralty Surveys by Rear-Admiral Henry C. Otter, and Staff-Commander G. F. McDougall. 6th edit. London: Taylor, Garnett, Evans & Co., 1911. Size 9½ × 6, pp. xii. and 434. *Index-charts and Illustrations.*

United Kingdom—Wales. **Rhys.**

The South Wales coast from Chepstow to Aberystwyth. By Ernest Rhys. (The County Coast Series.) London: T. Fisher Unwin, 1911. Size 8 × 5, pp. 390. *Illustrations. Price 6s. net. Presented by the Publisher.*

United Kingdom—Water-supply. **Baldwin-Wiseman.**

The Administrative aspect of Water Conservancy. By William Ralph Baldwin-Wiseman. (From the *Journal of the Society of Engineers*, April 3, 1911.) [London], 1911. Size 8½ × 5½. *Sketch-maps and Tables.*

United Kingdom—Water-supply. **Baldwin-Wiseman.**

The Conservation of our National Water Resources. By William Ralph Baldwin-Wiseman. (From the *Transactions of the Surveyors' Institution*, vol. 43, Part V., 1911.) London, 1911. Size 8½ × 5½, pp. 177–276.

Gives an account of water-conservation departments in other countries, and urges the need of similar measures in this country.

ASIA.

Baluchistan—Cave dwellings. *Petermanns M.* 57 (1911) [ii.]: 62–64. **Zugmayer.**

Die Höhlenwohnungen von Gondrani in Balutschistan. Von Dr. Erich Zugmayer. *Plans and Illustrations.*

Central Asia—Tian-shan. **Dungern-Oberau.**

Tian-schan: Jagd- und Reisebriefe. Von O. Freiherrn von Dungern-Oberau. Berlin: D. Reimer, [1910]. Size 9 × 7½, pp. xii. and 222. *Illustrations. Price* 8 *m.*

China—Ethnology. **Nairn.**

The Iu or Yan Lo tribe of South China. By A. L. Nairn. 1910. Size 10½ × 8, 36 ll. [Typewritten.] *Presented by the Author.*

China—Mines. ———

China. Memorandum on Chinese Mines. (Diplomatic and Consular Reports, Miscellaneous Series, No. 680, 1911.) London, 1911. Size 9½ × 6, pp. 12.

Chinese Empire—Tibet. **Kinthup.**

Explorations on the Tsang-po in 1880-84. By explorer Kinthup, with extracts from Colonel Sir H. R. Thuillier and Colonel H. C. B. Tanner's Reports, 1886–1887. Published under the direction of Colonel S. G. Burrard. Dehra Dun, 1911. Size 11 × 8½, pp. 16. *Map.*

An exact reprint of the original report (see August number, p. 202).

Eastern Asia. **Zepelin.**

Russland in Asien; Band xi. Der Ferne Osten: seine Geschichte, seine Entwickelung in der neuesten Zeit und seine Lage nach dem russisch-japanischen Kriege. Von C. von Zepelin. 3 Teil. Berlin: Zuckerschwerdt und Co., 1911. Size 9½ × 6½, pp. viii. and 224. *Price* 6*s.* 6*d.*

French Indo-China—Annam. *Tour du Monde* 17 (1911): 61–108. **Vassal.**

Mes trois ans d'Annam. Par Gabrielle M. Vassal. *Sketch-map and Illustrations.*

French Indo-China—Historical. *T'oung Pao* II. 10–12 (1909–11): *passim.* **Cordier.**

La politique coloniale de la France au début du second empire (Indo-Chine, 1852–1858). Par Henri Cordier.

French Indo-China—Railway. *La G., B.S.G. Paris* **23** (1911): 480–483. **Baudesson.**

Le Transindochinois. Par le Capitaine Baudesson. *Sketch-map.*

The author has carried out surveys for the future railway (see p. 431, *ante*).

India—Burma. **Evans.**

Big-game shooting in Upper Burma. By Major G. P. Evans. With a glossary of Burmese words. London: Longmans & Co., 1911. Size 9 × 6, pp. xiv. and 240. *Map and Illustrations. Price 7s. 6d. net.*

India—East Bengal and Assam—Ethnology. **Endle.**

The Kachâris. By the late Rev. Sidney Endle. (Published under the orders of the Government of Eastern Bengal and Assam.) London: Macmillan & Co., 1911. Size 9 × 5½, pp. xx. and 128. *Map and Illustrations. Price 8s. 6d. net. Presented by the Publishers.*

India—Punjab—Hydrology. **Bellasis.**

Punjab rivers and works. A description of the shifting rivers of the Punjab plains and of works on them, namely, inundation canals, flood embankments, and river-training works, with the principles for designing and working them. By E. S. Bellasis. Allahabad [London: E. and F. N. Spon], 1911. Size 13 × 8, pp. iv. and 66. *Maps and Sections. Price 7s. net. Presented by the Author.*

See review, p. 522, *ante*.

Japan—Eta. *Petermanns M.* **57** (1911): [ii.]: 64–67. **Stübe.**

Zur Kulturgeschichte der Eta, der "unehrlichen Menschen," in Japan. Von Dr. Rudolf Stübe.

Japan—Language. **Seidel.**

Wörterbuch der deutsch-japanischen Umgangssprache, mit einem Abriss der Grammatik der japanischen Umgangssprache und unter Berücksichtigung der Phraseologie. Von A. Seidel. Berlin: Märkische Verlag, 1910. Size 8½ × 5½, pp. viii. and 518. *Price 12m. Presented by the Publishers.*

Though intended for Germans in the first instance, this dictionary of words and phrases in everyday use may be useful also to visitors of other nationalities.

AFRICA.

Abyssinia. **Rathjens.**

Beiträge zur Landeskunde von Abessinien. Von Dr. Carl Rathjens. (Sonder-abdruck aus den *Mitteilungen der Geographischen Gesellschaft in München.*) Munich, 1911. Size 9½ × 6½, pp. 90. *Maps, Sections, and Illustrations.*

Africa. **Kassner.**

My journey from Rhodesia to Egypt, including an ascent of Ruwenzori and a short account of the route from Cape Town to Broken Hill and Lado to Alexandria. By Theo Kassner. London: Hutchinson & Co., 1911. Size 9 × 5½, pp. xiv. and 310. *Maps and Illustrations. Price 12s. 6d. Presented by the Author.*

Africa—Colonization. *J. African S.* **40** (1911): 392–397. **Boyce.**

The Colonization of Africa. By [Sir] Rubert Boyce.

Africa—Fishes. **Boulenger.**

Catalogue of the fresh-water fishes of Africa in the British Museum (Natural History). Vol. 2. By George Albert Boulenger. London: Longmans & Co., 1911. Size 11 × 7½, pp. xii. and 530. *Illustrations. Presented by the British Museum (Natural History).*

Africa—Languages. *Z. Deutsch. Morgenländ. Ges.* **65** (1911): 177–220. **Meinhof.**

Das Ful in seiner Bedeutung für die Sprachen der Hamiten, Semiten und Bantu. Von Carl Meinhof.

Africa—Rubber. **Christy.**

The African rubber industry and *Funtumia elastica* ("Kickxia"). By Cuthbert Christy. London: J. Bale, Sons, & Danielsson, 1911. Size 9 × 5½, pp. xvi. and 252. *Map, Illustrations, and Diagrams. Price 12s. 6d. net. Presented by the Publishers.*

Noticed at p. 523, *ante*.

Belgian Congo—Stanley Falls Mission. **Smith.**

"Yakusu": the very heart of Africa. Being some account of the Protestant Mission at Stanley Falls, Upper Congo. By H. Sutton Smith. London: Marshall Bros., [1911]. Size 9 × 5½, pp. xviii. and 288. *Sketch-map and Illustrations. Price 6s. net. Presented by the Publishers.* [See p. 524, *ante*.]

British East Africa. **Tucker.**

Eighteen Years in Uganda and East Africa. By Alfred R. Tucker, Bishop of Uganda. New edition. London: E. Arnold, 1911. Size 8 × 5, pp. xvi. and 362. *Map and Illustrations. Price 7s. 6d. net.*

British East Africa—Ethnology. **Beech.**

The Suk: their language and folklore. By Mervyn W. H. Beech. With Introduction by Sir Charles Eliot. Oxford: Clarendon Press, 1911. Size 9 × 5½, pp. xxiv. and 152. *Sketch-maps and Illustrations. Price 12s. 6d. net. Presented by the Publishers.*

French Guinea. **Arcin.**

André Arcin. Histoire de la Guinée française; Rivières du Sud; Fouta-Dialo; Région du sud du Soudan. Paris: A. Challamel, 1911. Size 10 × 6¼, pp. x. and 752. *Maps and Illustrations. Price 10s.*

NORTH AMERICA.

Canada. **Department of Mines.**

Summary report of the Geological Survey Branch of the Department of Mines for the calendar year 1910. Ottawa, 1911. Size 10 × 6½, pp. x. and 314. *Sketch-maps, Sections, and Illustrations.*

Canada—British Columbia. **Chapman.**

Canada. Department of Mines. Geological Survey Branch, Memoir No. 11–T. Triangulation and spirit-leveling of Vancouver Island, B.C., 1909. By R. H. Chapman. Ottawa, 1910. Size 10 × 6½, pp. 32. *Diagram.*

Canada—British Columbia. **Maguire.**

The Gates of our Empire. I. British Columbia. By Dr. T. Miller Maguire. London, 1910. Size 8½ × 5½, pp. 76. *Maps.*

Canada—British Columbia. **Minister of Mines.**

Annual Report of the Minister of Mines for the year ending December 31, 1910, being an account of Mining Operations for Gold, Coal, etc., in the Province of British Columbia. Victoria, B.C., 1911. Size 10½ × 7½, pp. 270. *Maps, Illustrations, Plans, and Sections.*

The total value of the mineral production was higher in 1910 than in any previous year, the chief increase being in coal.

Canada—Historical. *B.S.G. Québec* **5** (1911): 205–211. **Sulte.**

Un Niagara disparu. Par Benjamin Sulte.

Discusses the condition of the St. Maurice when visited by Père Buteau and others in 1651.

Canada—Historical. **Hearne and Tyrrell.**

A journey from Prince of Wales's Fort in Hudson's Bay to the Northern Ocean in the years 1769, 1770, 1771, and 1772. By Samuel Hearne. New edition, [edited] by J. B. Tyrrell. (The Publications of the Champlain Society, vol. 6.) Toronto, 1911. Size 10 × 6½, pp. xvi. and 438. *Maps and Illustrations (facsimile and original). Purchased.*

Canada—Ontario—Survey. **Goldthwait.**

Canada. Department of Mines. Geological Survey Branch, Memoir No. 10. An instrumental survey of the shorelines of the extinct lakes Algonquin and Nipissing in South-western Ontario. By J. W. Goldthwait. Ottawa, 1910. Size 10 × 6½, pp. 58. *Sketch-maps, Illustrations, and Diagrams.*

Canada—Quebec. *B.S.G. Québec* **5** (1911): 157–184. **Rouillard.**

Chicoutimi et Lac St. Jean. Par Eug. Rouillard. *Map and Illustrations.*

Canada—Quebec—Geology. **Wilson.**

Canada. Department of Mines. Geological Survey Branch. Geology of an area adjoining the east side of Lake Timiskaming, Quebec. By Morley E. Wilson. Ottawa, 1910. Size 10 × 6½, pp. 46. *Map and Illustrations.*

Canada—Quebec—Geology. **Wilson**

Canada. Department of Mines. Geological Survey Branch, Memoir No. 4. Geological reconnaissance along the line of the National Transcontinental Railway in Western Quebec. By W. J. Wilson. Ottawa, 1910. Size 10 × 6½, pp. 56. *Map and Illustrations.*

Canada—Surveys. **(Deville.)**

Department of the Interior. Annual Report of the Topographical Surveys Branch, 1909-1910. Ottawa, 1911. Size 9½ × 6½, pp. v. and 162. *Illustrations.*

Mexico. *National G. Mag.* **22** (1911): 475–508. **Birkinbine.**

Our Neighbor, Mexico. By John Birkinbine. *Map and Illustrations.*

Mexico. **Pan American Union.**

Mexico: a general sketch. Compiled by the Pan American Union. Washington, D.C., 1911. Size 9½ × 6½, pp. 320 and xviii. *Maps, Illustrations, and Diagrams. Presented by the Pan American Union.*

Mexico—Lower California. *National G. Mag.* **22** (1911): 443–474. **Nelson.**

A Land of Drought and Desert—Lower California. Two Thousand Miles on Horseback through the Most Extraordinary Cacti Forests in the World. By E. D. Nelson. *Illustrations.*

North America. **Chamberlain.**

North America: a supplementary geography. By J. F. Chamberlain and A. H. Chamberlain. ('The Continents and their People.') New York (London: Macmillan & Co.), 1911. Size 7½ × 5, pp. xii. and 300. *Map and Illustrations. Price* 3*s. Presented by the Publishers.*

North America—Geological History. **Wright.**

The Ice Age in North America and its bearings upon the antiquity of man. By Dr. G. Frederick Wright. Fifth edition. Oberlin, Ohio (London: C. Higham & Son), 1911. Size 9 × 6, pp. xxii. and 764. *Maps, Illustrations, and Diagrams. Price* 20*s. net. Presented by C. Higham and Son.*

United States—Arizona. **Barringer.**

Meteor Crater (Formerly called Coon Mountain or Coon Butte) in Northern Central Arizona. By D. M. Barringer. [Philadelphia, 1909.] Size 12½ × 8, pp. 24. *Sketch-maps, Sections, and Illustrations. Presented by the Author.*

United States—Arizona. **Fewkes.**

Smithsonian Institution. Bureau of American Ethnology, Bulletin 50. Preliminary report on a visit to the Navaho National Monument, Arizona. By Jesse Walter Fewkes. Washington, 1911. Size 9½ × 6, pp. 36. *Sketch-map, Plans, and Illustrations.*

United States—California. **Andrews.**

J. and P.R.S. New South Wales **44** (1910): 262–315.

An excursion to the Yosemite (California), or Studies in the Formation of Alpine cirques, "steps" and valley "treads." By E. C. Andrews. *Illustrations and Sections.*

United States—California. **Karsten.**

Vegetationsbilder (Karsten and Schenck) **9** (1911): Plates 1–12.

Kalifornische Coniferen. Von Dr. G. Karsten.

United States—Colorado—Meteorology. **Henry.**

B. Mount Weather Observatory **3** (1910): 201–225.

Variations of temperature and pressure at summit and base stations in the Rocky Mountain region. By Alfred J. Henry. *Diagrams.*

United States—Ethnology. **Swanton.**

Smithsonian Institution. Bureau of American Ethnology. Bulletin 43. Indian Tribes of the Lower Mississippi Valley and adjacent coast of the Gulf of Mexico. By John R. Swanton. Washington, 1911. Size 9½ × 6, pp. vi. and 388. *Map and Illustrations.*

Account of the tribes, their customs and history, with copious extracts from the writings of travellers.

United States—Michigan. *J. Geology* **19** (1911): 216–222. **Parkins.**

Valley filling by intermittent streams. By A. E. Parkins. *Sketch-map and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine.

The Argentine Year Book, 1910. London: W. H. Smith & Son, [1911]. Size 8½ × 5½, pp. 428. *Sketch-maps. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Magellan Strait. **Markham.**

Early Spanish voyages to the Strait of Magellan. Translated and edited . . . by Sir Clements Markham. (Works issued by the Hakluyt Society; Second Series, No. 28.) London, 1911. Size 9 × 6, pp. xii. and 288. *Maps (facsimile and original) and Illustrations. Purchased.*

Panama Canal. **Arias.**

The Panama Canal: a study in international law and diplomacy. By Harmodio Arias. (Studies in Economics and Political Science, edited by . . . the Director of the London School of Economics, No. 25.) London: P. S. King & Son, 1911. Size 8½ × 5½, pp. xiv. and 188. *Price 10s. 6d. net. Presented by the Publishers.*

South America. **Porter.**

The ten republics: an introduction to the South American Series in Porter's Progress of Nations. By Robert P. Porter. London: E. Routledge & Sons, 1911. Size 7½ × 5, pp. x. and 292. *Sketch-maps. Price 2s. 6d. net. Presented by the Publishers.*

Uruguay. **Maesto.**

El Uruguay a través de un siglo. La jornada civilizadora realizada en la República Oriental del Uruguay y el brillante porvenir de esta nación americana. Obra escrita por Carlos M. Maesto. Montevideo: Tip. Moderna, 1910. Size 15½ × 11, pp. 536. *Sketch-maps, Illustrations, and Diagrams. Presented by H.E. the Uruguayan Envoy and Minister.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *J. and P.R.S. New South Wales* **44** (1910): 226–251. **Duckworth.**

Notes on "A White Australia." By A. Duckworth.

New South Wales. **Maiden and Cambage.**

J. and P.R.S. New South Wales **43** (1909): 123–138.

Botanical, Topographical and Geological notes on some routes of Allan Cunningham. By J. H. Maiden and R. H. Cambage. *Sketch-map and Illustrations.*

Cunningham accompanied Oxley in 1817. His journals have never been published, though still in existence.

Papua. **Pritchard.**

Papua: a handbook to its history, inhabitants, physical features, and resources, etc. Compiled from Government records and other sources by W. Charles Pritchard. London: Society for Promoting Christian Knowledge, 1911. Size 7 × 4½, pp. 96. *Sketch-map and Illustrations. Price 1s. 6d. Presented by the Publishers.*

POLAR REGIONS.

Arctic—Spitsbergen. **Miethe and Hergesell.**

Mit Zeppelin nach Spitzbergen: Bilder von der Studienreise der deutschen arktischen Zeppelin-Expedition. Herausgegeben von A. Miethe und H. Hergesell. Berlin, etc.: Bong & Co., [1911]. Size 11 × 7½, pp. iv. and 292. *Illustrations. Price 9s.*

Greenland. *Geol. Charakterbilder* (*Stille*) (1911): Heft 7; 8 Plates. **Heim.**

West-Grönlands Basalt- und Sedimentgebirge. Von Arnold Heim.

MATHEMATICAL GEOGRAPHY.

Aviation Maps. *Petermanns M.* **57** (1911) [ii.]: 31–34. **Peucker.**

Die Brüsseler Konferenz der Internationalen Kommission für die Luftschifferkarte. Von Dr. Karl Peucker.

See report on this Conference in the September number, p. 323.

Navigation. *Rev. Maritime* **188** (1911): 5–10. **Thoulet.**

Navigation d'après la ligne de pente du fond. Par J. Thoulet. *Diagrams.*

Survey. **Ball.**

Ministry of Finance, Egypt. Survey Department. A new method of coast-surveying. By John Ball. Survey Department Paper No. 21. Cairo, 1911. Size 10½ × 7, pp. 46. *Diagrams.*

See notice at p. 525, *ante*. The coast-line is surveyed by the observation at fixed stations of depression-angles to successive points thereon.

Survey instrument. *M. k.k. G. Ges. Wien* **54** (1911): 227–242. **Brückner.**

Oberleutnant E. v. Orels Stereoautograph als Mittel zur automatischen Herstellung von Schichtenplänen und Karten. Von Prof. Dr. Ed. Brückner. *Sketch-map, Illustrations, and Diagrams.*

Surveying instrument. *Petermanns M.* **57** (1911) [ii.]: 92–94. **Steeb.**

Der Stereoautograph und die Kartographie. Von Christian Fehrn. v. Steeb.

This instrument was described in the October number, p. 420.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. **Hann.**

Handbuch der Klimatologie. Von Dr. Julius Hann. 3 . . . Auflage. (Bibliothek Geographischer Handbücher . . . Neue Folge, herausgegeben von Prof. Dr. Albrecht Penck). III. Band. (Klimatographie; 2. Teil: Klima der gemässigten Zonen und der Polarzonen.) Stuttgart: J. Engelhorns Nachf., 1911. Size 9 × 6½, pp. x. and 714. *Sketch-maps and Diagrams. Price* 23*m. Presented by the Publishers.*

Geophysics—Kant's Views. **Adickes.**

Kants Ansichten über Geschichte und Bau der Erde. Von Dr. Erich Adickes. Tübingen: J. C. B. Mohr, 1911. Size 9½ × 6½, pp. viii. and 208. *Price 4s. 9d.*

Meteorology. **Henkel.**

Weather science: an elementary introduction to meteorology. By F. W. Henkel. London: T. Fisher Unwin, 1911. Size 8½ × 5½, pp. 336. *Sketch-maps and Illustrations. Price 6s. net. Presented by the Publisher.*

Reviewed at p. 526, *ante.*

Meteorology—Southern Hemisphere. **Lockyer.**

Solar Physics Committee. Southern hemisphere surface-air circulation: being a study of the mean monthly pressure amplitudes, the tracks of the anticyclones and cyclones, and the meteorological records of several Antarctic Expeditions. By Dr. William J. S. Lockyer. London: Wyman & Sons, 1910. Size 12 × 10, pp. iv. and 110. *Maps and Diagrams. Price 6s. Presented by the Author.*

Oceanography. **Monaco.**

Cabinet Scientifique de S. A. S. le Prince de Monaco. Carte générale bathymétrique des Océans: listes pour chaque feuille des autorités consultés pour l'établissement de la 1re édition, des corrections à effectuer à la 1re édition, des nouveaux sondages communiqués par diverses autorités depuis l'établissement de la 1re édition. Paris, 1910. Size 10 × 6½, pp. 326. *Index-map.*

Oceanography—Temperatures. *B.I. Oceanog. Monaco,* No. 209 (1911): pp. 12. **Nielsen.**

Sur les températures des grandes profondeurs, particulièrement dans la Méditerranée. (Note préliminaire.) Par J.-N. Nielsen. *Diagrams.*

Soil analysis. *Cairo Sc. J.* **5** (1911): 107–119. **Beam.**

The Mechanical Analysis of Arid Soils. By Dr. W. Beam. *Diagram.*

Tides. *Queensland G.J.* **25** (1909–1910): 1–25. **Ruthven.**

Tides. By Captain J. F. Ruthven. *Diagrams.*

Tides. **Darwin.**

The tides and kindred phenomena in the Solar System. By Sir George Howard Darwin. Third edition. London: J. Murray, 1911. Size 8 × 5, pp. 24 and 438. *Sketch-maps and Illustrations. Price 7s. 6d. net. Presented by the Publisher.*

This edition has been brought up to date by the addition to the separate chapters of summaries of recent research.

Underground temperature. *Science* **33** (1911): 828–831. **Watson.**

Underground Temperatures. By Thomas L. Watson.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Sergi.**

G. Sergi. L'uomo secondo le origini, l'antichità, le variazioni e la distribuzione geografica: sistema naturale di classificazione. Milan: Fratelli Bocca, 1911. Size 9½ × 6, pp. xxviii. and 424. *Map and Illustrations. Price* 20 *lire.*

Commercial—Ports. *Deutsche Rundschau G.* **33** (1911): 193–201, 241–247. **Oppel.**
Die Seestädte der Erde nach ihren Leistungen im Schiffsverkehr und im Wertumsatz. Von Prof. Dr. A. Oppel.

Ethnology—Infanticide. *Deutsche Rundschau G.* **33** (1911): 222–227. **Funke.**
Die geographische Verbreitung des Kindermordes unter den Naturvölkern. Von Max Funke.

Ethnology—Kayak. *Petermanns M.* **57** (1911) [i]: 284–286. **MacRitchie.**
Der Kayak im nördlichen Europa. Von David MacRitchie. *Illustrations.*

Historical—Early Voyages. *Z. Kolonialpolitik* **13** (1911): 203–232. **Muchau.**
Die vorgeschichtlichen Beziehungen Nordafrikas zu Europa und den nordisch-germanischen Seevölkern. Von Prof. Dr. Hermann Muchau.

History of Cartography. *B.S.G. Italiana IV.* **12** (1911): 85–97. **Bertolini.**
Della Rosa dei Venti nell' *Exultet* di Bari, et di una figurazione geografica degli Atti degli Apostoli. Del prof. G. Lod. Bertolini. *Facsimile Illustrations.*

History of Cartography. *B.S.G. Italiana IV.* **12** (1911): 619–631. **Gribaudi.**
Di un mosaico cosmografico medioevale scoperto a Torino. Del prof. Pietro Gribaudi. *Facsimile Illustrations.*

History of Geography. *B.S.G. Italiana IV.* **12** (1911): 360–367. **Bertolini.**
Gli Evangelisti di Assisi e qualche altro caso di iconografia geografica. Del prof. G. Lod. Bertolini.

Racial Problems. **(Spiller.)**
Papers on inter-racial problems communicated to the First Universal Races Congress held at the University of London, July 26–29, 1911. Edited . . . by G. Spiller. London: P. S. King & Son, 1911. Size 10 × 6, pp. xlvi. and 486. *Price 7s. 6d. net. Presented by the Publishers.*

GENERAL.

British Empire. **Crofts.**
Britain on and beyond the sea; being a Handbook to the Navy League Map of the World. By Cecil H. Crofts. 6th edit. London: W. & A. K. Johnston, 1911. Size 7½ × 5, pp. xiv. and 168. *Map. Price 1s. 6d. Presented by the Publishers.*

British Empire. **Imperial Conference.**
Imperial Conference, 1911 (Dominions, No. 7). Minutes of Proceedings of the Imperial Conference, 1911. London, 1911. Size 13 × 8½, pp. 442. (Dominions, No. 8.) Papers laid before the Conference. London, 1911. Size 13 × 8½, pp. 302. *Diagrams.*

Education—Text-book. **Heaton.**
The Junior Scientific Geography. Book III. The British Empire. By Ellis W. Heaton. London: Ralph Holland & Co., [1911]. Size 7½ × 5, pp. viii. and 138. *Sketch-maps and Diagrams. Price 1s. net. Presented by the Publishers.*

Education—Text-book. **Kirk and Taylor.**
The Oxford Geographies. Edited by A. J. Herbertson. Junior Geography. Questions, by F. M. Kirk. Statistical Appendix, by E. G. R. Taylor. Oxford: Clarendon Press, 1911. Size 7½ × 5, pp. 28 and 14–64. *Price 1s. Presented by the Publishers.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria. **Bischofberger, Haritz, and Kremmer.**
Karte des politischen Bezirkes Deutsch-Landsberg, herausgegeben von den Bezirksschulräten Deutsch-Landsberg, Stainz und Eibiswald 1910. Bearbeitet von Oberlehr Ad. Bischofberger. Scale 1 : 100,000 or 1 inch to 1·6 stat. miles. *Price* 0.50 *kr.*—Karte des politischen Bezirkes Freistadt. Bearbeitet vom K. K. Bezirksschulinspektor Johann Haritz. Scale 1 : 150,000 or 1 inch to 2·4 stat. miles.—Karte

des politischen Bezirkes Kirchdorf. Bearbeitet vom K. K. Bezirksschulinspektor Johann Haritz. Scale 1 : 150,000 or 1 inch to 2·4 stat. miles.—Die K. K. Bezirkshauptmannschaft Weiz. Entworfen von Herm. Ritter v. Kremmer, Schulleiter in Feistritzwald. Scale 1 : 150,000 or 1 inch to 2·4 stat. miles. Vienna : G. Freytag & Berndt, 1910–1911. *Price* 1.30 *kr. each. Presented by the Publishers.*

Austria. **Freytag and Rohn.**

Karte der Raxalpe. Für Touristen bearbeitet von Gustav Freytag. Terrain auf Grundlage der Originalaufnahme des K. u. K. Militärgeographischen Institutes von Hans Rohn. Scale 1 : 25,000 or 2·5 inches to 1 stat. mile. Vienna : G. Freytag & Berndt, [1911]. *Price* 3.50 *kr. Presented by the Publishers.*

Austria-Hungary. **K. u. K. Militärgeographisches Institut.**

Spezialkarte der österreichisch-ungarischen Monarchie. Scale 1 : 75,000 or 1 inch to 1·2 stat. miles. Sheets : 2–xiii., Harrachsdorf ; 4–vii., Graslitz und Johanngeorgenstadt ; 4–xxxii., Beresteczko und Szczurowice ; 5–xxiii., Ujście Solne ; 6–xi., Königsaal und Beneschau ; 8–xiv., G. Meseritsch ; 8–xxiv., Bártfa und Muszyna ; 9–xxiv., Kisszeben ; 9–xxv., Girált ; 9–xxvi., Wola Michowa u. Izbugyaradvány ; 10–xxiv., Eperjes und Gölniczbanya ; 10–xxv., Varannó ; 10–xxxiii., Jagielnica und Czernelica ; 11–xxiv., Kassa (Kaschau) ; 11–xxv., Tóketerebes und Nagyszalàncz ; 12–xiv., Tulln ; 12–xv., Gänserndorf ; 12–xxxiii., Sniatyn ; 14–xxxiii., Oberwikow ; 15–iii., Füssen ; 23–iv., Avio und Valdagno ; 23–xi., Laas und Čabar ; 26–ix., Fasana ; 27–x., Unie und Sansego ; 34–xix., Bilek. Vienna : K. u. K. Militärgeographisches Institut, 1910–1911. *Price* 1*m. each sheet.*

These are new editions.

Belgium. **Institut Cartographique Militaire, Brussels.**

Carte des Chemins de Fer, Routes et Voies Navigables de la Belgique. Scale 1 : 320,000 or 1 inch to 5 stat. miles. Brussels : Institut Cartographique Militaire, 1911.

British Isles—England. **Bartholomew.**

Bartholomew's "Quarter Inch to Mile" Contour Road Map of the Environs of London. Scale 1 : 253,440 or 1 inch to 4 stat. miles. Edinburgh : John Bartholomew & Co., [1911]. *Price, mounted on cloth,* 2*s.* 6*d. net. Presented by the Publishers.*

The special feature of this map is the clear manner in which the roads are drawn, and their character distinguished. The relief of the land is shown by contours and colour tinting on the layer system.

British Isles—England. **Johnston.**

Bathy-Orographical Map of England. Scale 1 : 600,000 or 1 inch to 9 stat. miles. Edinburgh & London : W. & A. K. Johnston, Ltd., 1911. *Price, mounted on rollers and varnished,* 12*s. Presented by the Publishers.*

This is a school wall-map, mounted on rollers, measuring 50 by 42 inches. Relief of the land is shown on the layer system, in shades of green and reddish-brown, the contours selected being 200, 400, 600, 800, 1200, and 2000 feet, while the sea depths are shown by contour and blue tints at intervals of 100 feet from sea-level to 600 feet. The map is carefully drawn, and the leading physical features are well brought out. A better selection of colour tints might perhaps have been made, specially as regards the lower land. The names of principal towns are lightly printed in red and do not obscure the physical features of the map. The railways are indicated in the same colour. It will be instructive for the pupil to follow the lines taken by the railways as here shown in connection with the physical features of the country through which they pass. The names of physical features are prominently printed.

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from September 1 to 30, 1911.

4 miles to 1 inch scale maps :—

England and Wales. Sheets (19 and 23). 2nd edit. Printed in colours and folded in cover or flat in sheets. *Price, on paper,* 1*s.* 6*d.* ; *mounted on linen,* 2*s.* ; *mounted in sections,* 2*s.* 6*d.*

1-inch scale maps :—

England and Wales. Sheets 178, 212. 3rd edit. Engraved with hills in brown or black. *Price* 1*s. each.*

England and Wales. Sheets 290, 306. 4th edit. Engraved in outline. *Price* 1*s. each.*

6-inch scale maps:—

Cheshire, 4 sheets. **Hampshire**, 6 sheets. **Lancashire**, 1 sheet. **Sussex**, 2 sheets. **Yorkshire**, 16 sheets. *Price* 1*s. each.*

1 : 2500 scale maps:—

Berkshire, 30 sheets. **Cheshire**, 7 sheets. **Flintshire**, 7 sheets. **Hampshire**, 3 sheets. **Lancashire**, 6 sheets. **Sussex**, 14 sheets. **Yorkshire**, 18 sheets. *Price* 3*s. each.*

(*E. Stanford, London Agent.*)

British Isles—Scotland. **Philip.**

Philips' Visual Series of Improved Contour Outline Maps. Scotland. London: George Philip & Son, Ltd., [1911]. *Price* 1*s. net. Presented by the Publishers.*

One of the series of large black and white outline maps for schools with contour lines, printed on cartridge paper so that they can be hand-coloured for any special purpose. In the present case the 600, 1200, and 3000 feet contours are shown, otherwise the map is the barest outline, somewhat unnecessarily roughly drawn, with no rivers, and no names.

Bulgaria. **Kassner.**

Bevölkungsdichte in Bulgarien. Entworfen von Prof. Dr. C. Kassner. *Petermanns Mitteilungen*, Jahrgang, 1911, II., Tafel 17. Gotha: Justus Perthes, 1911. *Presented by the Publishers.*

Denmark. **Danish General Staff.**

Topografisk Kaart over Kongeriget Danmark udarbejdet og udgivet af Generalstaben. Scale 1 : 40,000 or 1·6 inch to 1 stat. mile. Sheets: Agersö, Fajö, Fredensborg, Frederiksværk, Gilleleje, Hellebæk, Helsingör, Hesselö, Hillerød, Hörsholm, Kjöge, Knudshoved, Kramnitse Gab, Maribo, Nakskov, Nyord, Nysted, Raageleje, Rödby, Ste Hedinge, Saxkjöbing, Stubbekjöbing, Taleren, Vejrö, Vemmetofte, Vindeby, Vordingborg. Copenhagen: Generalstabens Topografiske Afdeling, 1908–1910. *Presented by the Danish Government.*

Europe. **Freytag.**

G. Freytag's Radfahrer- und Automobilkarten. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheet 11, Posen. Vienna: G. Freytag & Berndt, [1911].

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: v.–13, Tréguier; viii.–14, St. Malo; ix.–14, Avranches; ix.–34, St. Vincent-de-Tyrosse; xii.–38, Gavarnie; xvii.–18, Gien; xviii.–29, St. Chély; xviii.–30, Marvejols; xviii.–31, St. Geniez; xix.–35, Cette; xx.–17, Tonnerre; xxiii.–35, Marseille. Paris: Hachette & Cie., 1911. *Price* 0.80 *fr. each sheet.*

These are new editions.

France. **Ministre des Travaux Publics, Paris.**

Carte Itinéraire des Voies Navigables de la France d'après le Guide Officiel de la Navigation Intérieure. Scale 1 : 1,500,000 or 1 inch to 23·6 stat. miles. Paris and Nancy: Berger-Levrault, 1911. New edition.

France. **Service Géographique de l'Armée.**

Carte Aéronautique de France. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheets: Amiens, Laon, Mézières. Paris: Service Géographique de l'Armée, 1911. *Price* 1.50 *fr. each sheet.*

The three trial sheets of the aeronautical map of France described by Mon. G. L. Lallemand in his article in the present number of the *Geographical Journal*, and exhibited by him at the recent meeting of the British Association at Portsmouth.

Russia. **Ilyin.**

Plan of St. Petersburg. Compiled from the latest official sources. Scale 1 : 19,690 or 3·2 inches to 1 stat. mile. St. Petersburg: A. Ilyin, 1911.

Switzerland. **Abteilung für Landestopographie, Bern.**

Topographische Karte der Schweiz. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: II., Belfort–Basel; V., Rheineck; VI., Besançon–Le Locle; IX., Schwyz–Sargans; X., Feldkirch–Arlberg; XII., Freyburg–Bern; XVII., Brig–Airolo;

XIX., Bellinzona-Chiavenna; XX., Sondrio-Bormio; XXIII., Domo d'Ossola-Arona; XXIV., Lugano-Como. Bern: Abteilung für Landestopographie, 1909-10.

Switzerland. **Wagner.**

Taschen-Atlas der Schweiz. 26 Kolorierte Karten gestochen und gezeichnet von Emil Wagner. Dritte Auflage durchgesehen und verbessert von der Geographischen Anstalt H. Kümmerly und Frey, Bern. Bern: Geographischer Kartenverlag, [1911].

The third edition of a useful little pocket atlas containing a railway map of Switzerland, a general map, and a set of district maps on scales varying from 1: 200,000 to 1: 600,000. At the beginning of the atlas there are thirty-three pages of tables and statistical matter.

ASIA.

India. **Joppen.**

Historical Atlas of India for the use of High Schools, Colleges, and Private Students. By Charles Joppen, S.J. Revised and enlarged edition. London: Longmans, Green & Co., 1911. *Price 3s. net. Presented by the Publishers.*

The second edition of a useful and inexpensive historical atlas of India, first published in 1907. There are altogether twenty-eight coloured maps, showing India at various dates from the conquests of Alexander the Great to the present time. In this edition three new maps have been added, one redrawn, and three produced on a larger scale. The text has been rearranged and printed in double columns.

Japan. **Imperial General Staff, Tokyo.**

Topographical map of Japan. Scale 1: 50,000 or 1·3 inch to 1 stat. mile. Sheets: Kobayashi, Marugamé. Tokyo: Imperial General Staff, 1906-1911. *Presented by Dr. N. Yamasaki.*

Korea. **Inouye.**

General Geological Map of Korea. Compiled by K. Inouye. Scale 1: 1,500,000 or 1 inch to 23·6 stat. miles. [Tokyo: Imperial Geological Survey, 1911.] *Presented by Dr. N. Yamasaki.*

An interesting map, giving the results of surveys recently made by Japanese geologists. The various formations are shown by colour tints and letters, and the location of coal, gold, silver, lead, copper, iron, and other minerals by symbols in black. Place-names and explanation of tints and symbols employed are in English as well as Japanese.

AFRICA.

Africa. **Geographical Section, General Staff.**

Map of Africa, compiled in the Geographical Section, General Staff, War Office. Scale 1: 250,000 or 1 inch to 3·9 stat. miles. Sheets: North A 36-M, Lake Albert; North A 36-O, Masindi Port; North A 36-P, Bululu; North A 36-T, Mubendi; North A 36-V, Ripon Falls; South A 36-B, Masaka. London: E. Stanford, Sifton Praed, J. Fisher Unwin, 1911. *Price 2s. net each sheet. Presented by the Director of Military Operations.*

Angola. **Commissão de Cartographia, Lisbon.**

Esboço da Carta de Angola. Scale 1: 2,500,000 or 1 inch to 39·4 stat. miles. 2 sheets. 2nd edit. Lisbon: Commissão de Cartographia, 1910.

Egypt. **Egyptian Survey Department.**

Topographical map of Egypt. Scale 1: 10,000 or 6·3 inches to 1 stat. mile. Sheets: N.E. 8-12, 9-12, 9-13, 10-13, 10-14, 11-14, Mudiria Sharqia; N.E. 26-6, 27-6, 28-6, 28-7, 29-6, 29-7, 30-5, N.W. 26-2, 26-3, 26-4, 26-5, 27-3, 27-4, 27-5, 28-3, 28-5, 29-3, 29-5, 29-6, Mudiria Gharbia. Giza: Survey Department, 1911. *Presented by the Director-General, Egyptian Survey Department.*

Egypt. **Egyptian Survey Department.**

Topographical map of Egypt. Scale 1: 50,000 or 1·3 inch to 1 stat. mile. Sheets: N.E. III.-IV. Tel el Kebîr, III.-V. Neffisha: N.W. I.-I. Qatta; S.E. I-I. Giza Pyramids, II.-I. Dahshûr, II-II, Ayat, III.-I. Reqqa, III.-II. Saf. Giza: Survey Department, 1911. *Presented by the Director-General, Egyptian Survey Department.*

Egyptian Sudan. **Survey Office, Khartum.**

Egyptian Sudan. Compiled at the Survey Office, Khartum. Scale 1: 250,000 or 1 inch 3·9 stat. miles. Sheets: 34-L, Selima; 45-A, Dongola; 45-B, El Kab; 45-C, Abu Hamed; 55-L, Doka. Khartum: Survey Office, 1911. *Price 10 P.T. each sheet. Presented by the Director of Sudan Surveys.*

French Equatorial Africa. **Périquet.**

Carte de la Région nord du Gabon de la mer à la Sangha. D'après les travaux de la Mission d'étude du Chemin de fer Libreville-Sangha (Chemin de fer du Nord 1910-1911) dirigée par le Capitaine Périquet de l'Artillerie Coloniale. Dressée et dessinée par les Capitaines Périquet et Crépet l'Artillerie Coloniale et le Sergent Debost de l'Infanterie Coloniale. Scale 1 : 500,000 or 1 inch to 7·8 stat. miles. 4 sheets. Paris: Henry Barrère, [1911]. *Presented by the Publisher.*

This map includes the region between the equator and 2° 20′ N. lat., and extends in longitude from the estuary of the Gabun to the Sangha river. It has been drawn under the direction of General Merlin, the governor, from the surveys of the mission undertaken to investigate the country with a view of constructing the railway from Libreville to the Sangha, under the charge of Captain Périquet, combined with the work of other French government officials in the country.

AMERICA.

Canada. **Department of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 122, Manitoba House, revised to March 24, 1911; 123, Fort Alexander, revised to June 2, 1911; 271, Mossy Portage, revised to June 15, 1911; 318, Shell River, revised to June 20, 1911. Ottawa: Department of the Interior, Topographical Surveys Branch, 1911. *Presented by the Department of the Interior, Ottawa.*

Canada. **Dept. of the Interior, Ottawa.**

Map showing branches of Chartered Banks in Manitoba, Saskatchewan, and Alberta. Scale 1 : 1,584,000 or 1 inch to 25 stat. miles. Ottawa: Department of the Interior, Topographical Surveys Branch, 1911. *Presented by the Department of the Interior, Ottawa.*

South America. **Ludwig.**

Nuevo Mapa de la Republica Argentina, Chile, Uruguay y Paraguay. Construido y publicado por la Oficina Cartografica de Pablo Ludwig. Scale 1 : 4,000,000 or 1 inch to 63·1 stat. miles. Buenos Aires: Pablo Ludwig, 1911.

A general map, printed in colours, showing railways, telegraphs, etc. It is in places too overcrowded with names, and so heavily coloured as to render it almost unintelligible, especially in the mountain regions. An enlarged plan of the environs of Buenos Aires is given as an inset.

United States. **Rand, McNally & Co.**

The Rand-McNally Indexed County and Township Pocket Map and Shippers' Guide of Utah. Scale 1 : 1,457,280 or 1 inch to 23 stat. miles. Chicago and New York: Rand, McNally & Co., 1911.

GENERAL.

Star Map. **Náběłek.**

Wandkarte des südlichen Sternhimmels (Bis zum 40° nördlich. Deklination. Stellung der Sterne um das Jahr 1910). Bearbeitet und herausgegeben von Prof. Dr. Fr. Náběłek, K.K. Schulrat in Kremsier. 6 sheets. *Price* 29 *kr.* Vienna: G. Freytag & Berndt, 1911. *Presented by the Publishers.*

A clearly drawn school wall-map of the southern constellations, and those north of the celestial equator as far as 40° declination. Stars from the first to the seventh magnitude are indicated by different symbols, in white and light blue upon a dark blue ground, and while the outlines of the constellations are given in dotted lines, their names do not appear on the map itself, but only around the border. Each constellation on the map bears a number, which is also given with the name in the list. In the lower corners there are diagrams showing the relative sizes and distances of the planets, a list of interesting celestial objects visible through an ordinary telescope, and another giving the approximate relative distances of a few fixed stars. When the six sheets are joined together the map measures 74 by 70 inches.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, from September 3 to 30, 1911. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 1627, England, east coast: Sunderland harbour, 3*s.* 3762, Australia, Queensland, east coast: Hay island to Bow reef, 3*s.* **New Editions**—No. 1859, England, west coast: King road, 2*s.* 2565, England, south coast:

Trevose head to Dodman point, including the Scilly isles, 3*s.* 34, England, south coast: The Scilly isles, 3*s.* 1491, England, east coast: Harwich harbour, 3*s.* 2256, Baltic sea, gulf of Riga: River Dvina, from the roadstead to the town of Riga, 3*s.* 2280, White sea: Arkhangel bay and the mouths of the North Dvina, 3*s.* 725, Spain, north coast: Guetaria bay, Rivadesella harbour, San Vincente de la Barquera harbour, Ria de Tina Mayor, 2*s.* 464, North America, east coast: Bay of Fundy: Passamaquoddy bay and St. Croix river, 3*s.* 1743, North America, east coast: Bay of Fundy: Port St. Andrew, 2*s.* 584, North America, west coast: British Columbia: Sydney inlet to Nitinat, including Clayoquot and Barkley sounds. (Plans: Refuge cove, Uchucklesit harbour, Island harbour, Entrance anchorage, Stamp harbour), 3*s.* 461, Africa, west coast: Wari and Benin rivers creeks, 3*s.* 718, Indian ocean islands: Islands off the north coast of Madagascar: Aldabra island, Cosmoledo group, Farquhar group, Entrance to inner harbour (Farquhar group), Astove island; plan of Assumption island on this sheet deleted, 2*s.* 35, Persian gulf: Basidu and its approaches, Basidu anchorage, 2*s.* 1235, Persian gulf: Mouth of the Euphrates: Shatt al Arab and Bahmishir river, the bar below Muhammera, Karun river, 3*s.* 753, Persian gulf: Entrance of the Persian gulf, 3*s.* 1460, Eastern Archipelago: Ports in Arafura sea: Banda harbour, Kei Dulah harbour, Dobo harbour, Dilhi harbour, Kissa island anchorage, Oliliet anchorage, Letti island anchorage, 2*s.* 2468, Eastern archipelago: Plans of anchorages in Sumba, Timor, and adjacent islands, Memboro road, Terong road, Lawayang road, Ilwaki road, Seba road, Batu Bao road, Karbaffo bay, Baah road, Naikliu road, South anchorage (Liran island), Sagu bay, Atapopa road, Waingapu road, Cyrus harbour, Dalolo anchorage, Palmedo road, 2*s.* 1259, Korea, south coast: Fusan harbour with the adjacent coast of Tchao sian; plan of Commemoration bay on this sheet erased, 3*s.* 3666, Korea, east coast: East coast of Korea: Fusan harbour; to Chukupen bay (plans: Chukupen bay, Chukusan po); plan added: Urusan harbour (Commemoration bay), 3*s.* 116, Australia, east coast: Mourilyan harbour, 2*s.* 3419, Australia, east cast: Goode island anchorage, 2*s.*

(*J. D. Potter, Agent.*)

Atlantic. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, August, 1911. Pilot chart of the South Atlantic Ocean, September, October, and November, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Atlantic, North. **U.S. Weather Bureau.**

Meteorological chart of the North Atlantic Ocean, October, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological charts of the North Atlantic and Mediterranean, September and October, 1911. London: Meteorological Office, 1911. *Price 6d. each. Presented by the Meteorological Office.*

Burma. **Hunton and Smith.**

Burma, Rangoon River, harbour limits to North D'Silva Point. Surveyed 1910–1911, by A. S. Hunton. River Surveyor, and V. G. Smith, Asst. River Surveyor under the direction of H. G. G. Ashton, Deputy Conservator of the Port. Scale 1 : 12,102 or 5·2 inches to 1 stat. mile. Rangoon: Commissioners for the Port of Rangoon, 1911. *Presented by H. G. G. Ashton, Esq., Deputy Conservator of the Port of Rangoon.*

Indian Ocean. **Meteorological Office.**

Monthly Meteorological charts of the Indian Ocean, September and October, 1911. London: Meteorological Office, 1911. *Price 6d. each. Presented by the Meteorological Office.*

Indian Ocean. **U.S. Hydrographic Office.**

Pilot chart of the Indian Ocean, October, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Indian Ocean. **U.S. Weather Bureau.**

Meteorological chart of the Indian Ocean, October, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, October, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Pacific, North. **U.S. Weather Bureau.**

Meteorological chart of the North Pacific Ocean, October, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

PHOTOGRAPHS.

Chile and Bolivia.

Eighteen photographs of the railway from Arica to La Paz. *Presented by Sr. L. Riso Patrone.*

A very interesting set of photographs, measuring 8¼ by 11 inches. They are decidedly characteristic of this part of South America, and the country through which the railway under construction from the coast at Arica in Chile to La Paz, the capital of Bolivia, has to pass.

(1) Arica; (2 and 3) Vallee de Lluta; (4) Quebrada de Lluta, K 77 Chironta; (5) Quebrada de Lluta "El brinco," 6 K 90, 7 K 93¼; (8) Rio Lluta; (9) Quebrada de Lluta, K 95; (10) Quebrada de Lluta, La Angostura; (11) Angostura; (12) Cascada de Angostura; (13) Quebrada de Lluta, K 97; (14) Patapalani; (15) Plaza de Tacna; (16) Inclinado de Junin.

Himalayas. **Luke.**

Ten photographs taken during a journey to the Pindari Glacier, Himalayas, by James Luke, Esq. *Presented by James Luke, Esq.*

The Pindari glacier is on the western slopes of Nanda Kot, just south of the famous Nanda Devi mountain, in the Garhwal Himalayas. The photographs give a good idea of the glacier and the scenery on the way to it from Almora. They measure 3¼ by 4¼ inches.

(1) Gang of convicts at Almora; (2) Bageswar; (3) View from Dankuri bungalow; (4) "Coolie log" with myself in centre; (5) "Coolie log" crossing a picturesque bridge; (6) A beautiful waterfall; (7) View about one mile from Pindari glacier; (8) The immediate approach to Pindari glacier; (9) Ice cascade, Pindari glacier; (10) Pindari glacier.

London.

Seven reproductions of unpublished drawings of London views, etc., by deceased artists, in various public and private collections. London: London Topographical Society, 1911.

These seven reproductions are as follows: No. 1, Warders' Lodgings, Tower of London; No. 2, The Church of St. Benet Fink as seen after the fire at the Royal Exchange; No. 3, *The Times* Printing House, Printing House Square, Blackfriars, from drawings in the British Museum, made by John Wykeham Archer, 1843 to 1851; No. 4, The Entrance Court of Burlington House, looking towards Piccadilly; No. 5, The Entrance Court of Burlington House, Piccadilly, looking towards the house; No. 6, Colonnade in the Entrance Court of Burlington House, Piccadilly, looking east, from drawings in the Soame Collection, made by an assistant of Sir John Soame about 1811; No. 7, Cheyne Walk, Chelsea, from a drawing in the Victoria and Albert Museum, made by James Miller, and dated 1776. These reproductions are printed in collotype by Emery Walker, and published in a portfolio, which has been designed to include other additions to this series that may be issued later on as well as those it now contains.

North-Eastern Rhodesia. **Melland.**

Sixteen photographs of the Bangweulu Lake Region, North-Eastern Rhodesia, taken by Frank H. Melland, Esq. *Presented by Frank H. Melland, Esq.*

Mr. Melland's journeys during which these photographs were taken were described in the *Geographical Journal* for last month. The character of the lake is well shown by the views.

(1) River Chambeshi; (2) Wisa village on Lake Chaya; (3) A bay on Lake Chaya; (4 and 5) Steel boat on Lake Chaya; (6) Musonkole river; (7) A corner of Nsamba's village on Nsalushi island; (8) A village on Nsalushi island; (9) Mushili Chula and Mutima Chula natives at Matongo; (10) Old Euphorbia hedge on Matongo; (11) Wa-

Unga men on Lunga; (12) Wa-Unga women at Kasoma's; (13) Kasoma's village; (14) Walking to Mweshe's; (15) Village on Sumpa; (16) View from canoe on approaching Sumpa.

Western Australia. **Canning.**

Twenty-seven Photographs taken on the Wiluna-Kimberley Stock Route, Western Australia, 1906–7 and 1908–10, by A. W. Canning, Esq. *Presented by A. W. Canning, Esq.*

A map showing the route traversed by Mr. Canning was given in the *Geographical Journal* for July last. The photographs are important as a great deal of the country was previously unexplored. They measure 5 by 4 inches.

(1) Camels travelling over sandridges; (2) Loaded camels travelling over spinifex; (3) Native drawings; (4) Packing up; (5) North pool; (6) Windich springs; (7) Goats at No. 5 well; (8) Pierre springs; (9) No. 8 well; (10) Showing Forrest's tree and hut, weld springs; (11) No. 13 well; (12) Goats at No. 13 well; (13) Durba pool; (14) Lower pool, Killagurra springs; (15) Upper pool, Kellagurra springs; (16) Native drawings, Killagurra springs; (17) Mujingerra, native water; (18) Camels coming through oaks, Libral; (19) Wardabunna rockhole; (20) Camels crossing Tobin lake; (21) M. Tobin's grave at Waddawalla; (22) Guli, shallow native water; (23) Native coming in from hunting, Billowaggi; (24) Camels loaded with oak timber near No. 49 well; (25 and 26) Natives, Sturt creek; (27) Open grassy downs, East Kimberley.

World. **Kent.**

Sixty-six photographs taken during a trip round the world (1909) by A. Barton Kent, Esq. *Presented by A. Barton Kent, Esq.*

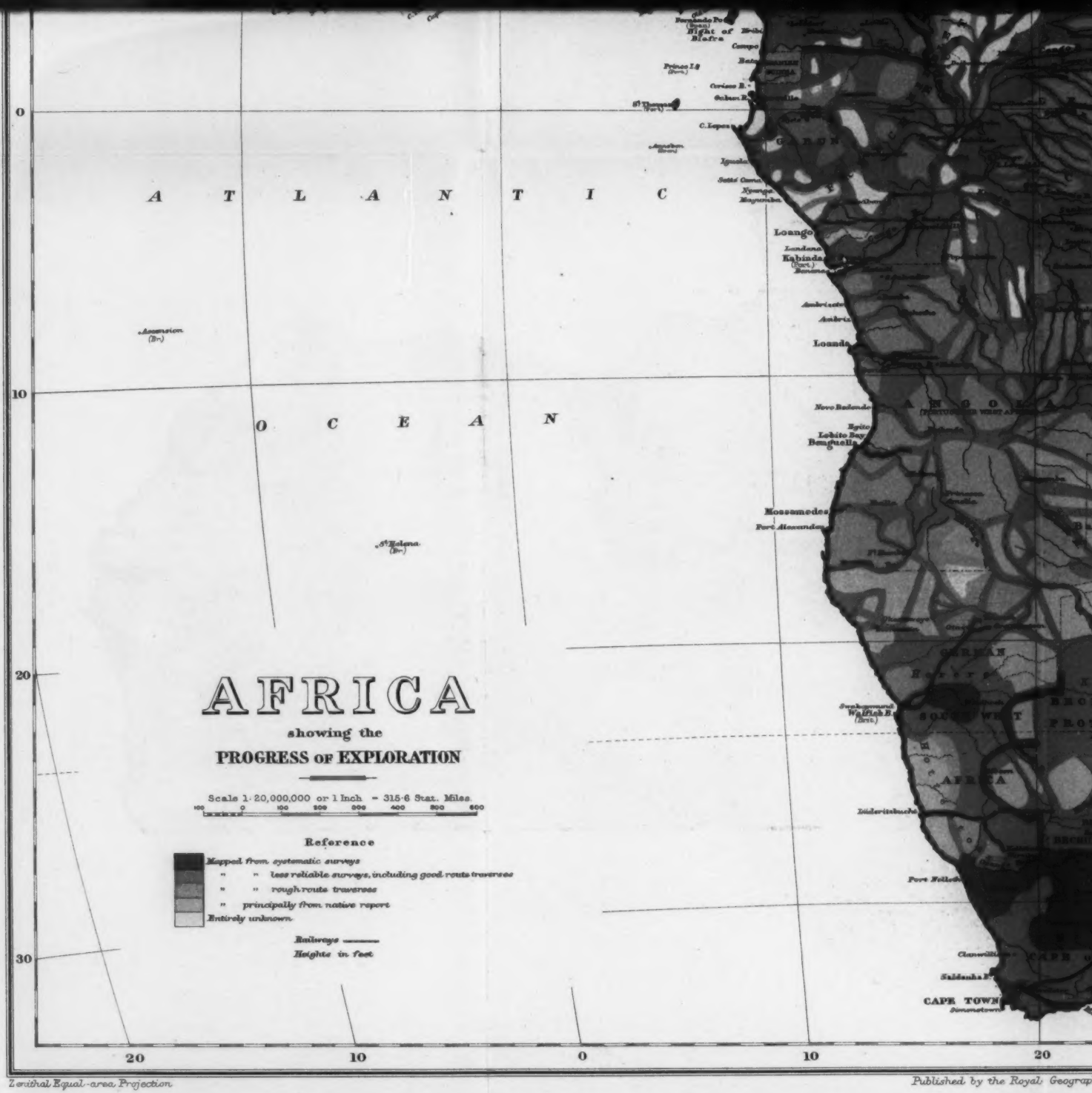
Although none of these photographs are of places not easily visited by the tourist or ordinary traveller, yet they form a useful addition to the Society's collection. Mr. Barton Kent made his trip round the world in connection with his business, but took advantage of his opportunities to take these interesting photographs.

Asia. *India*:—(1) Landing-stage, Elephanta, Bombay; (2) The old fort, Bombay; (3) Yacht Club, Bombay; (4) Apollo Bunder, Bombay; (5) Fountain and Law Courts, Bombay; (6) Wadia fountain, Bombay; (7) Bullock-cart, Bombay; (8) View outside Bombay; (9) Chahtris, Jaipur; (10) Maharajah's Lady gardens, Jaipur; (11) Old temple on road from Jaipur to Amber; (12) Kashmiri gate, Delhi; (13) Lahore gate, Delhi; (14) Chandni Chavk bazaar, Delhi; (15) John Nicholson's statue, Delhi; (16) Fathepur Sikri; (17) Gate of Victory, Fathepur Sikri; (18) Dewan-i-am, Fathepur Sikri; (19) Stambouli Sultana's house, Fathepur Sikri; (20) Taj Mahal, Agra; (21 and 22) Pearl Mosque, Agra; (23) West side of Mausoleum, Sikandra; (24) Roof, Sikandra; (25) Massacre Ghat, Cawnpur; (26) Memorial well, Cawnpur; (27) Observatory, Benares. *Ceylon*:—(28) Mount Lavinia; (29) Colombo; (30) Street scene, Colombo; (31) Bathing at Colombo; (32) View across the lake, Colombo; (33) Bullock-carts, Colombo; (34) Catamarans, Colombo; (35) Street scene, Kandy. **America.** *Canada*:—(36) Parliament House, Toronto; (37) Landing-stage, Toronto; (38) Statue of Macdonald, Toronto; (39) Montreal from Mount Royal; (40) S.S. *Quebec* and grain elevators, Montreal; (41) Notre Dame de bon Secours, Montreal; (42) Chateau Frontenac, Quebec. **Australasia.** *New South Wales;* (43) View of Sydney harbour; (44 and 45) Botanical gardens, Sydney; (46) Cave house, Jenolan caves; (47) Devil's coachhouse, Jenolan caves. *Queensland*:—(48) Custom-house, Brisbane. *Victoria*:—(49) View from Kerami, Marysville. *New Zealand*:—(50) Queenstown, Lake Wakatipu; (51) Queenstown and Waterpeak; (52) In the Domain, Queenstown; (53) Lake Wakatipu and waterpeak; (54) Hell gate and Skipper's drive, Lake Wakatipu; (55) Looking down Lake Wakatipu; (56 and 57) Greymouth; (58) Trolly ferry, Buller river; (59) Tunnelled arch, Buller gorge; (60) Coach trotting down the Buller gorge; (61) The junction Inangahua; (62) Bath houses, Rotorua; (63) Hamuara spring, Rotorua; (64) Tikitere; (65) Whakarewarewa; (66) Bridge at Whakarewarewa.

N.B. It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

20
10
0
10
20
30
20
10
0
SPAIN
M E D I T
Sicily
Malta (Br.)
Madeira Is. (Port.)
Funchal
Canary Islands
Tenerife (Spain)
Gran Canaria
MOROCCO
SOUTH TERRITORY
Agadir
Mogador
Rabat
Tripoli
Gulf of Sidra
TRIPOLI
C. Bojador
Tropic of Cancer
RIO DE ORO
SAHARA
Bahr el Juf
C. Blanco
Arguin I.
C. Timiris
Nouakchott
St Louis
Dakar
Bathurst
GAMBIA
PORTUGUESE GUINEA
FRENCH GUINEA
SIERRA LEONE
Freetown
LIBERIA
IVORY COAST
ASHANTI
TOGO
Bight of Benin
CAMEROONS
Bight of Biafra
Prince I. (Port.)
St Thomas (Port.)
GABON
Libreville
Loango
Landana
Kabinda (Port.)
Ambriz
Loanda
Ascension (Br.)
A T L A N T I C

20
30
40
50
60
30
20
10
0
ASIA MINOR
PERSIA
ARABIA
PERSIAN GULF
Gulf of Oman
Gulf of Aden
Cyprus (Brit.)
Beirut
Damascus
Baghdad
Tehran
Cyrenaica
Libya
EGYPT
Desert
SERT
Wajanga Fm
Baghawa
Ardfila
Aden (Br.)
Socotra
Bandar Bela
ANGLO-EGYPTIAN SUDAN
Shilluk
BRITISH EAST AFRICA PROTECTORATE
UGANDA PROTECTORATE
GERMAN EAST AFRICA
Mombasa
Pemba
Zanzibar
Dar es Salam
Amirante Is. (Br.)
Seychelles (Br.)
INDIAN OCEAN

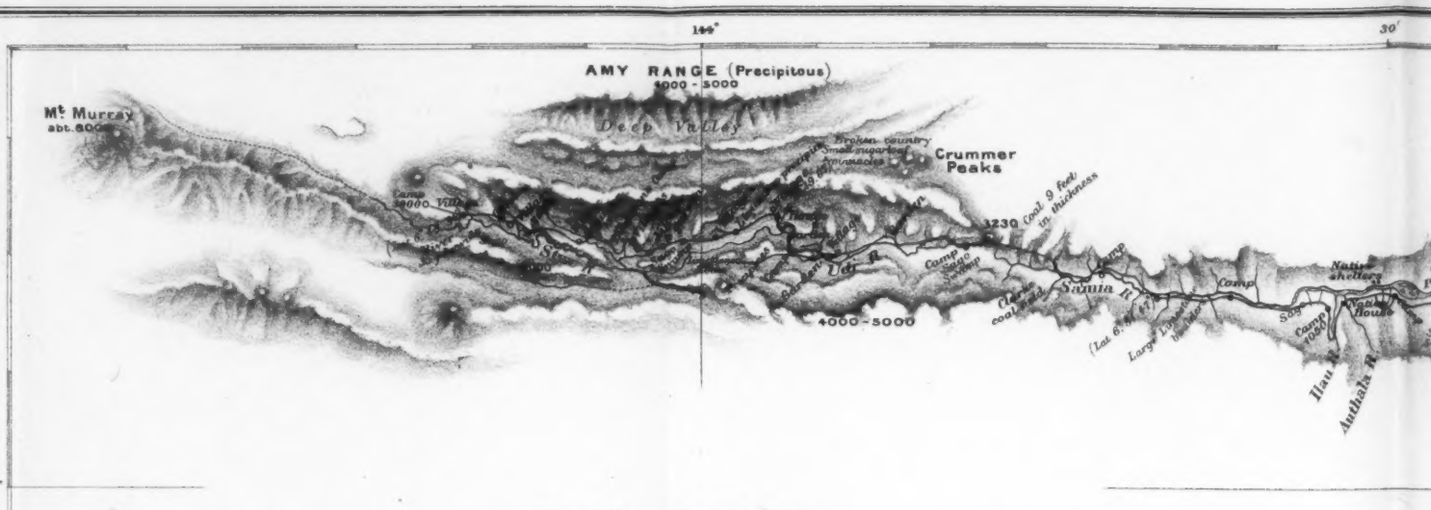


Zenithal Equal-area Projection

Published by the Royal Geograp

yal Geographical Society.

EXPLORATION OF AFRICA.
Cana.


AMY RANGE (Precipitous)
4000 - 5000
Deep Valleys
Mt Murray
abt. 8000
Crummer Peaks
Broken country
Camp 9000 Yds
Camp
Camp
Camp

This map is based upon a compass survey
checked by astronomically determined latitudes.
The coastline is taken from the Admiralty Chart.

145°

CENTRAL PAPUA
MACKAY & LITTLE